

2022 Spring Flood Outlook: Red River and Devils Lake Basins

February 24, 2022

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Photo courtesy of Vince Godon

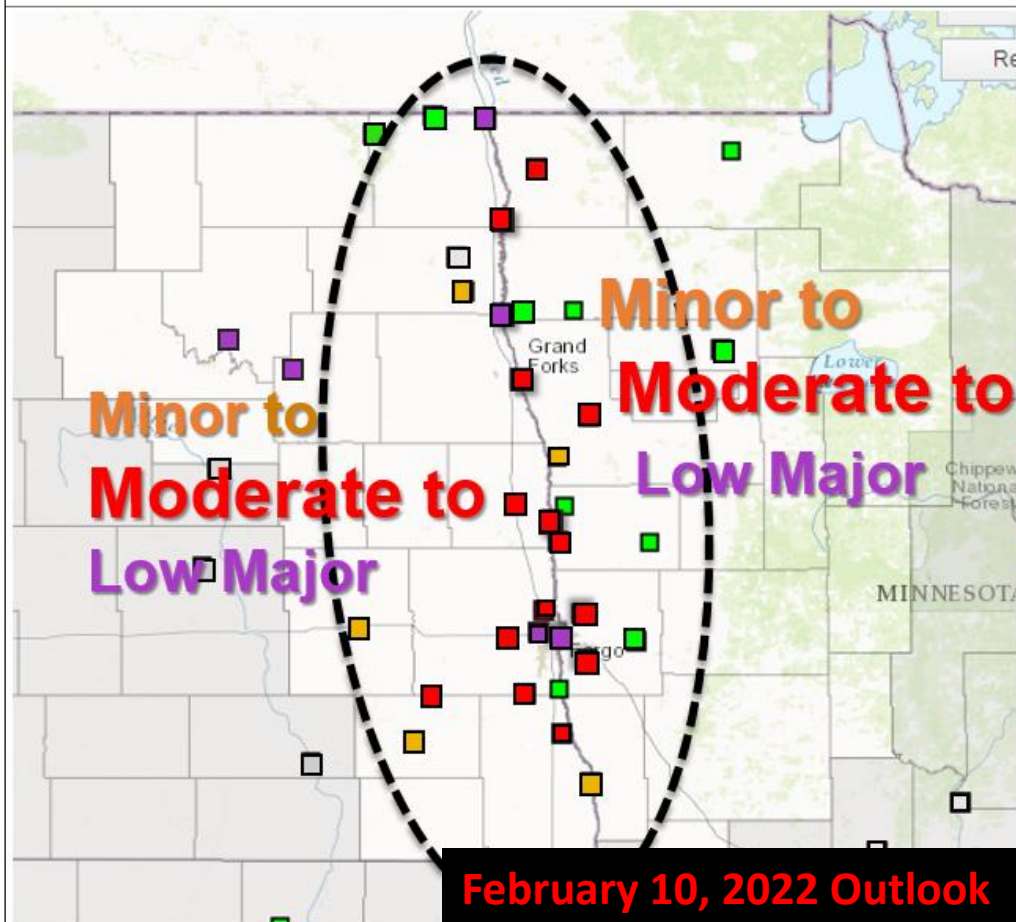
Bottom Line up Front:

- Risk for *significant flooding* is overall higher than historic* (raised once again since February 10th outlook).
- Generally *moderate to low end major flooding* is the main threat for most (with some pockets of *minor flooding*).
 - Dry/drought conditions from 2021 are much improved due to fall precipitation.
 - Soil moisture and base streamflow near normal.
 - Snowpack/snow water content generally above normal.
- A brief warm up in the near term looks to trend back towards colder than normal temperatures with minor precipitation chances.
- March/April/May climate predictions suggest equal chances for below/normal/above temperatures and precipitation (i.e., no strong signal in any direction).

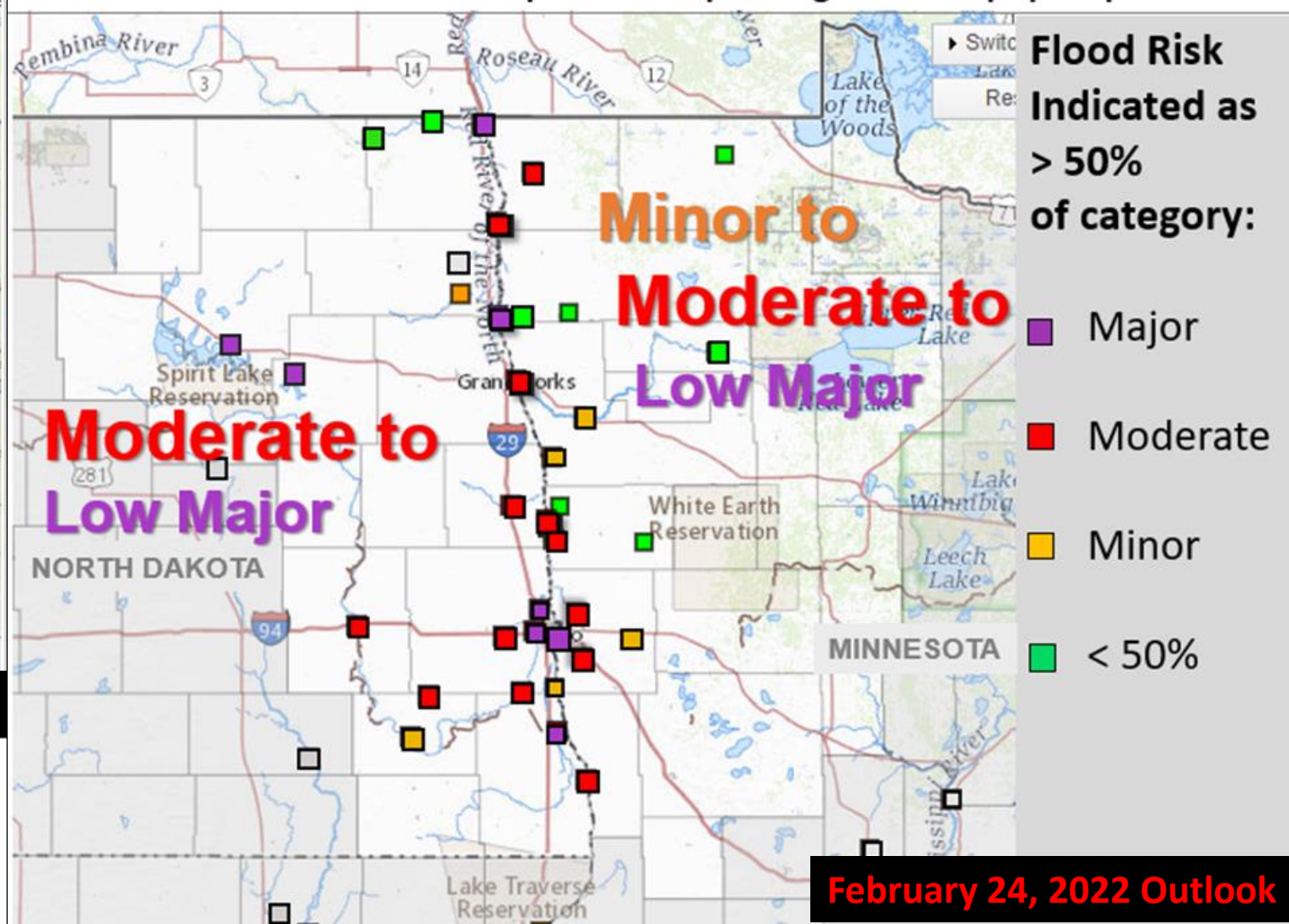
*Refers to Conditional Risk (this year) versus Historical Risk

Flood Risk by Category at River Forecast Points

Near to Above Normal Runoff Expected... depending on Feb-Mar-Apr precipitation!

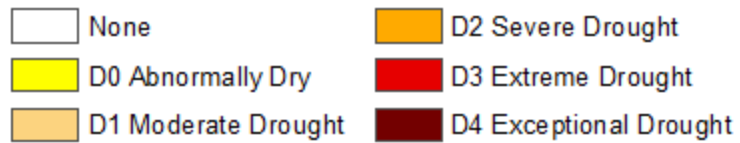
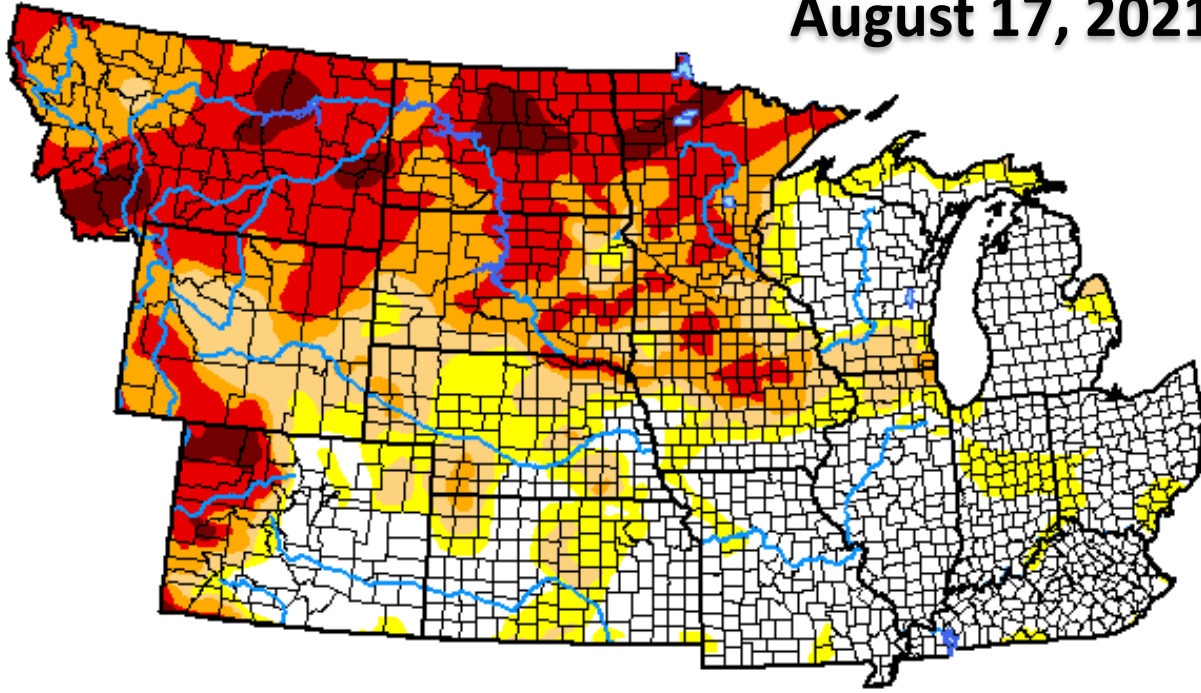


Near to Above Normal Runoff Expected... depending on Mar-Apr precipitation!



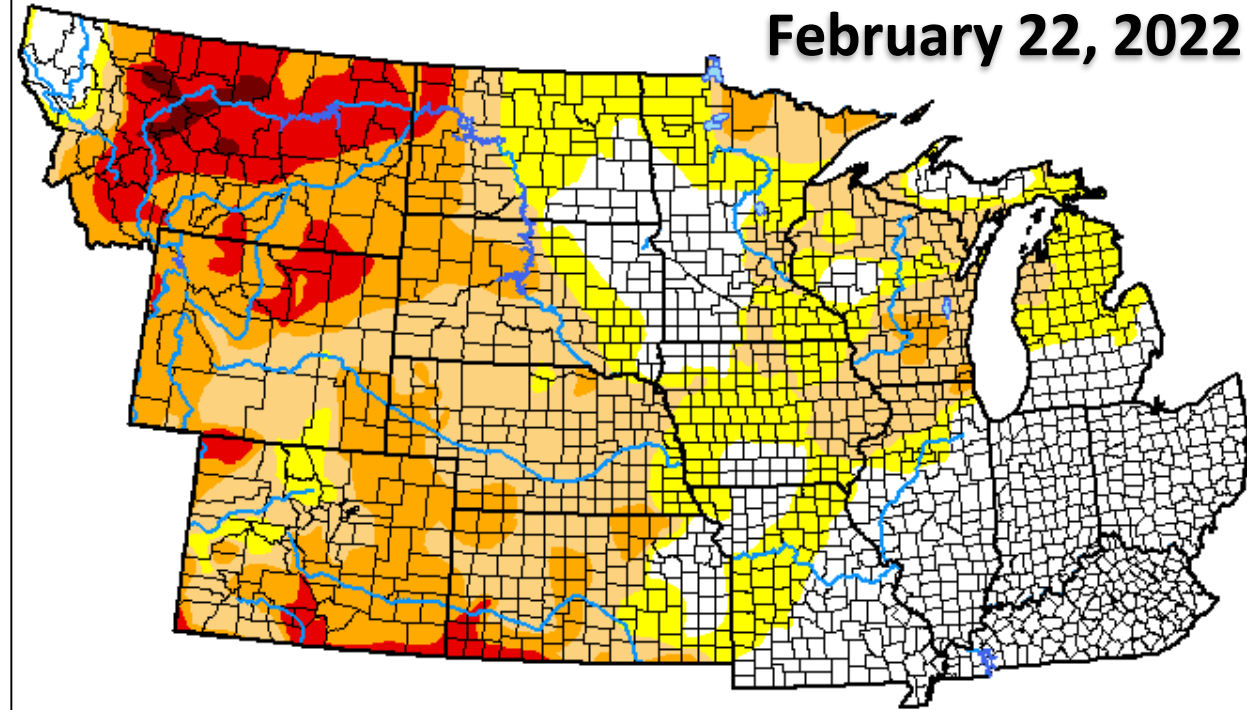
U.S. Drought Monitor

August 17, 2021



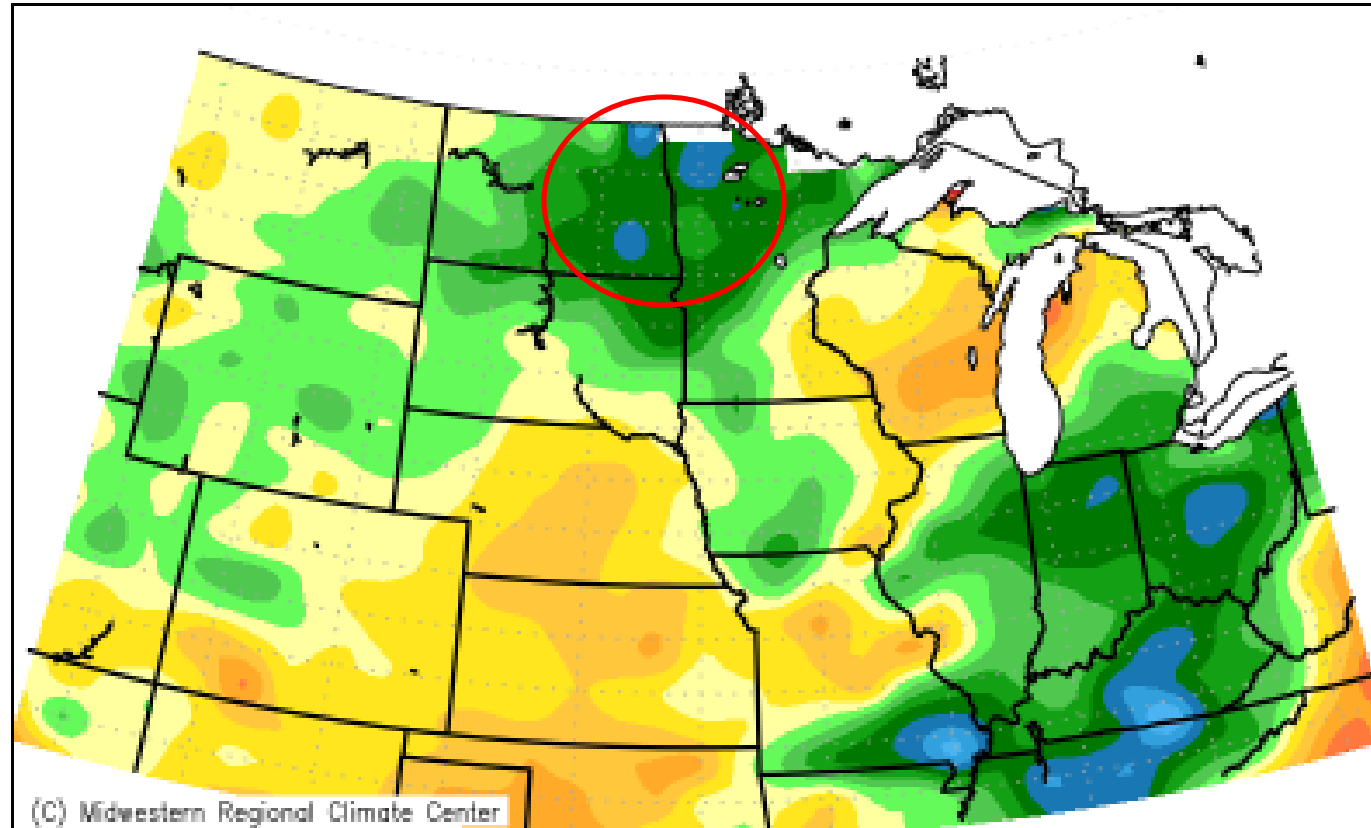
droughtmonitor.unl.edu

February 22, 2022

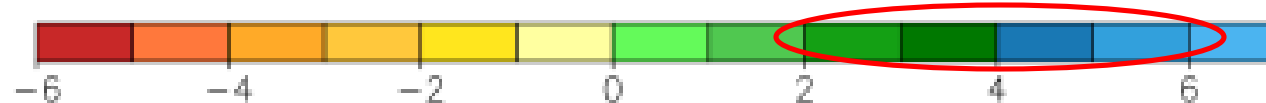


Fall-Winter Precipitation

Accumulated Precipitation (in): Departure from Mean
October 1, 2021 to February 24, 2022



Mean period is 1991–2020.



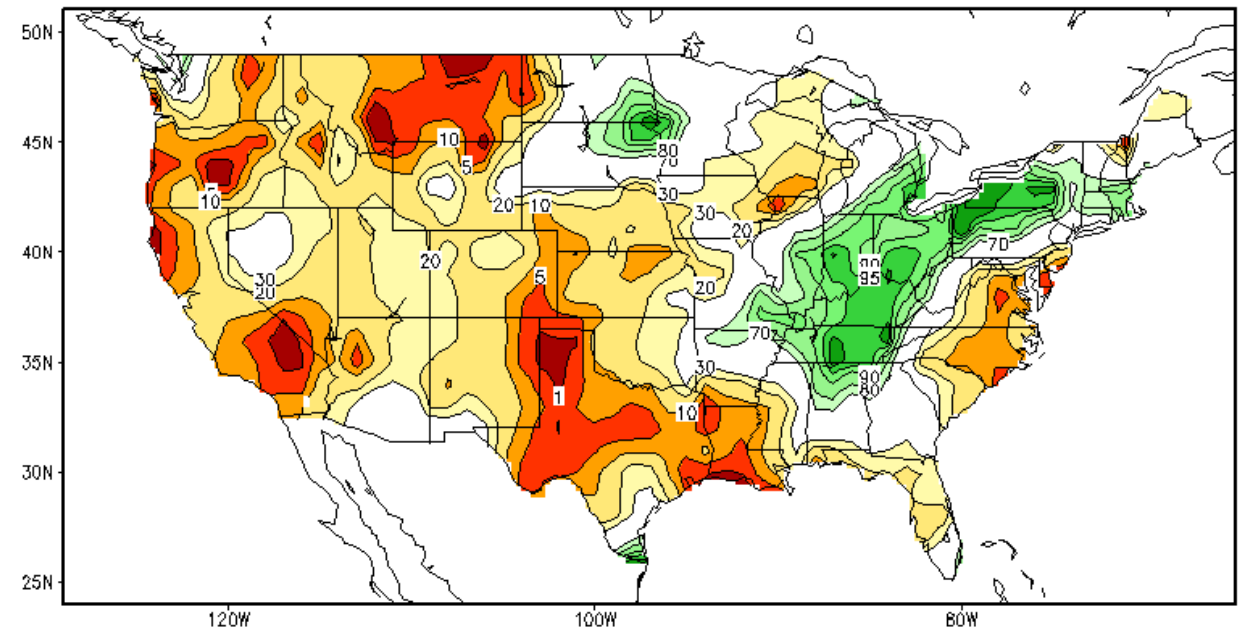
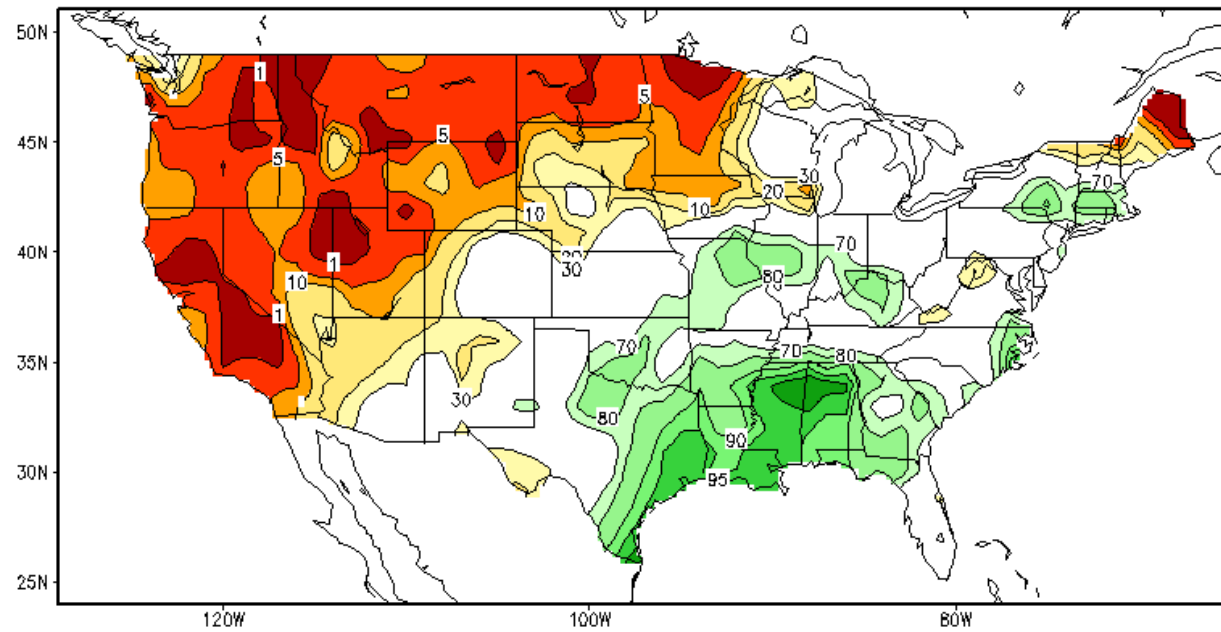
Summer vs Winter Soil Moisture

6 Months Ago (July 2021)

vs Yesterday (February 2022)

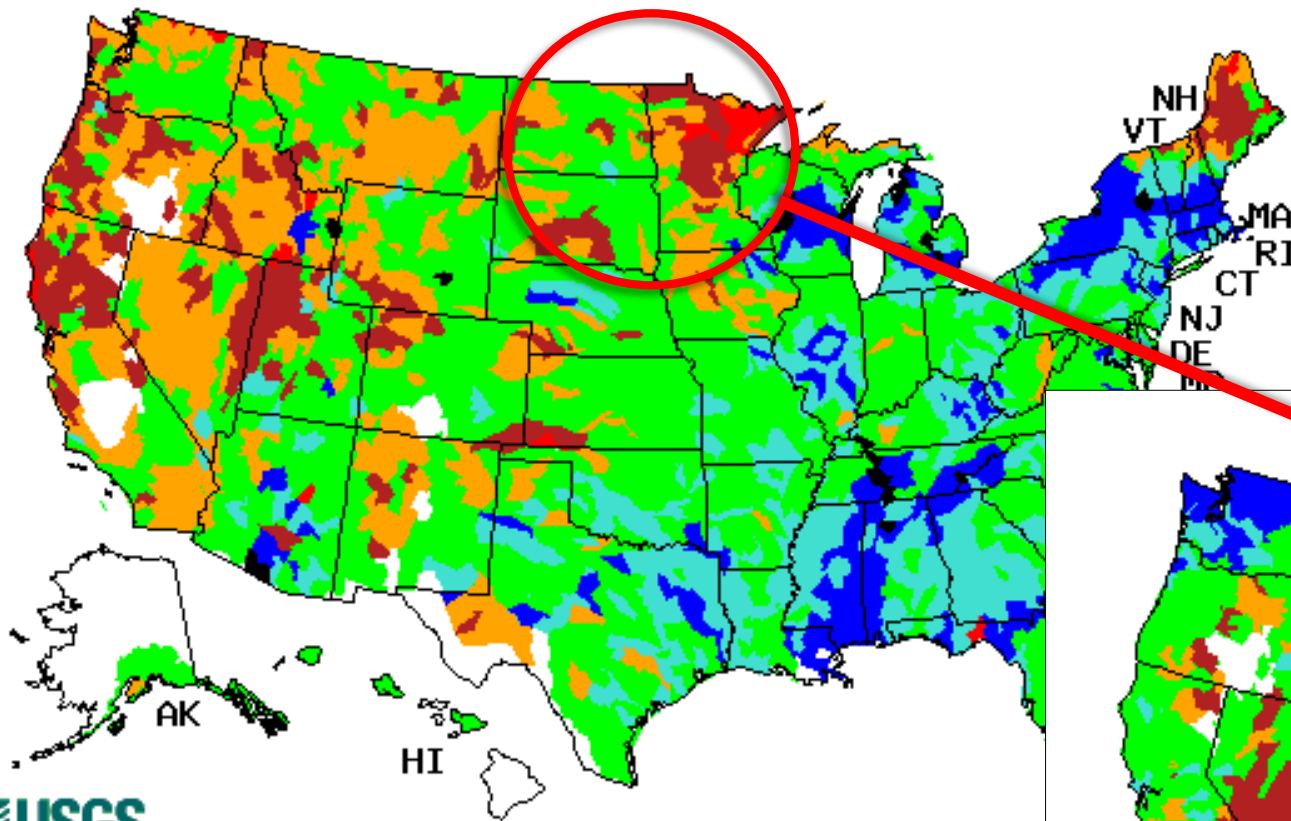
Calculated Soil Moisture Ranking Percentile
JUL, 2021

Calculated Soil Moisture Ranking Percentile
FEB 23, 2022



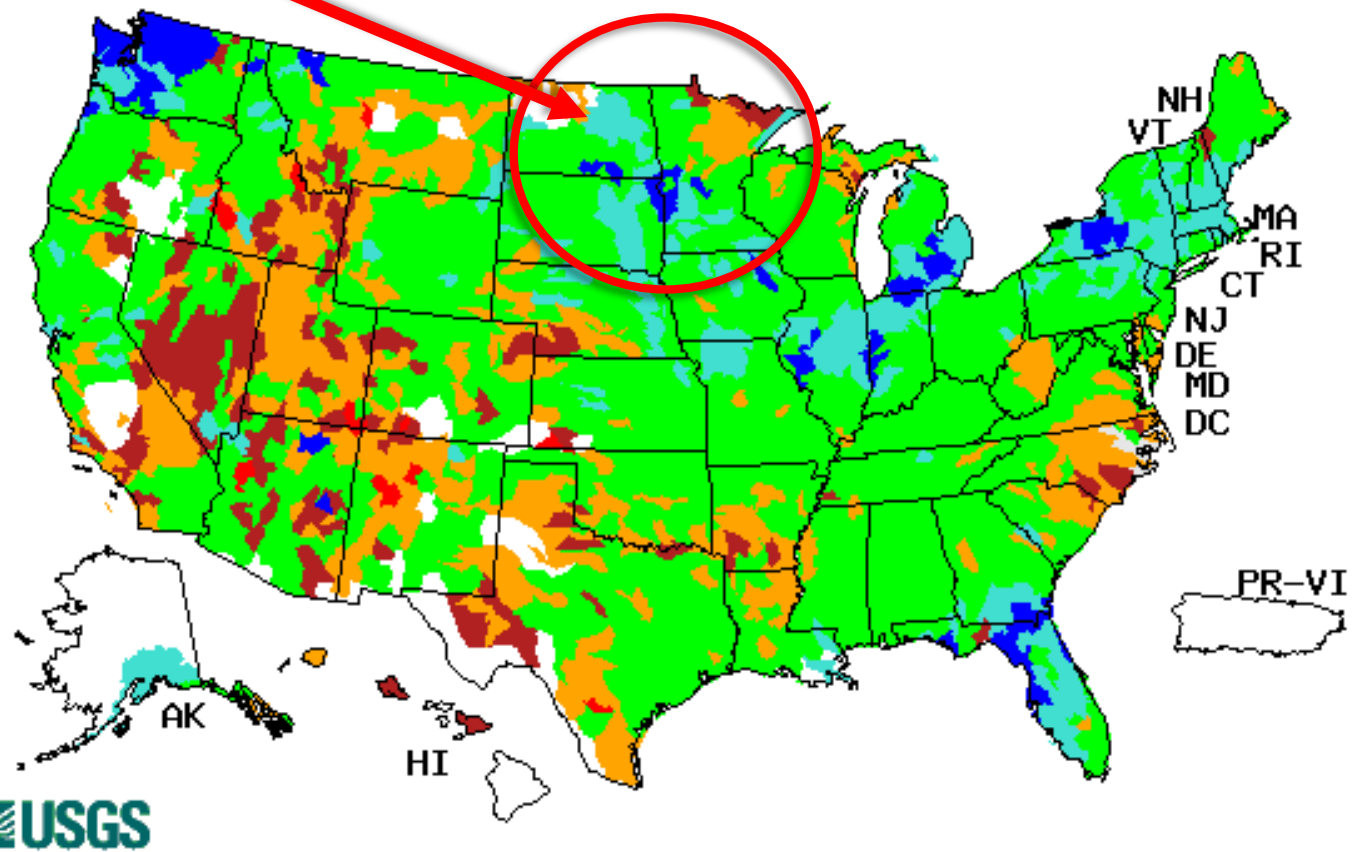
Current NWS/CPC analysis has the basin within +/- 1 inch of normal in top ~3 ft of soil

August 2021



**Much needed fall rains led to
near normal streamflow
heading into freeze-up**

November 2021

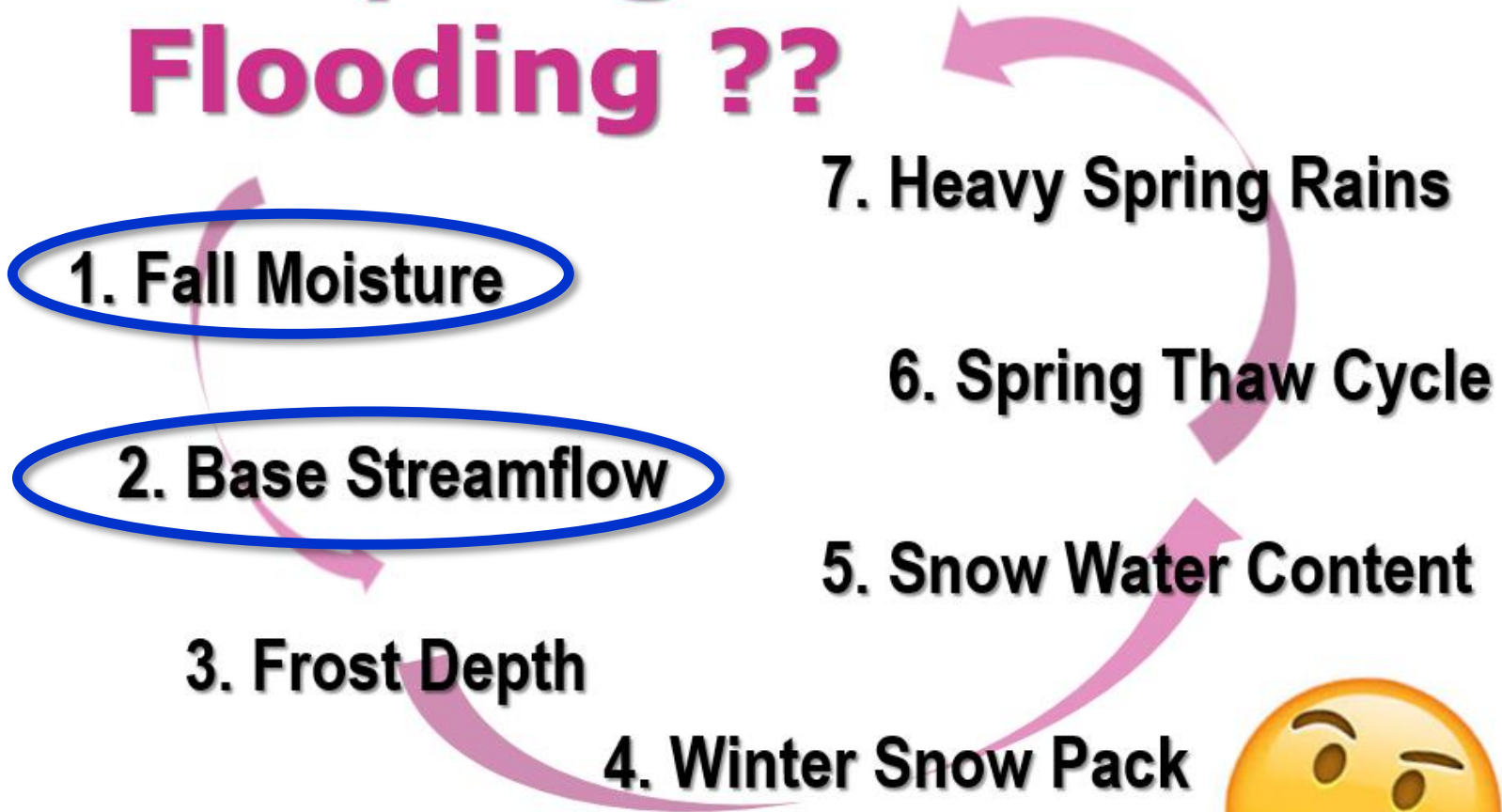


Explanation - Percentile classes

Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	

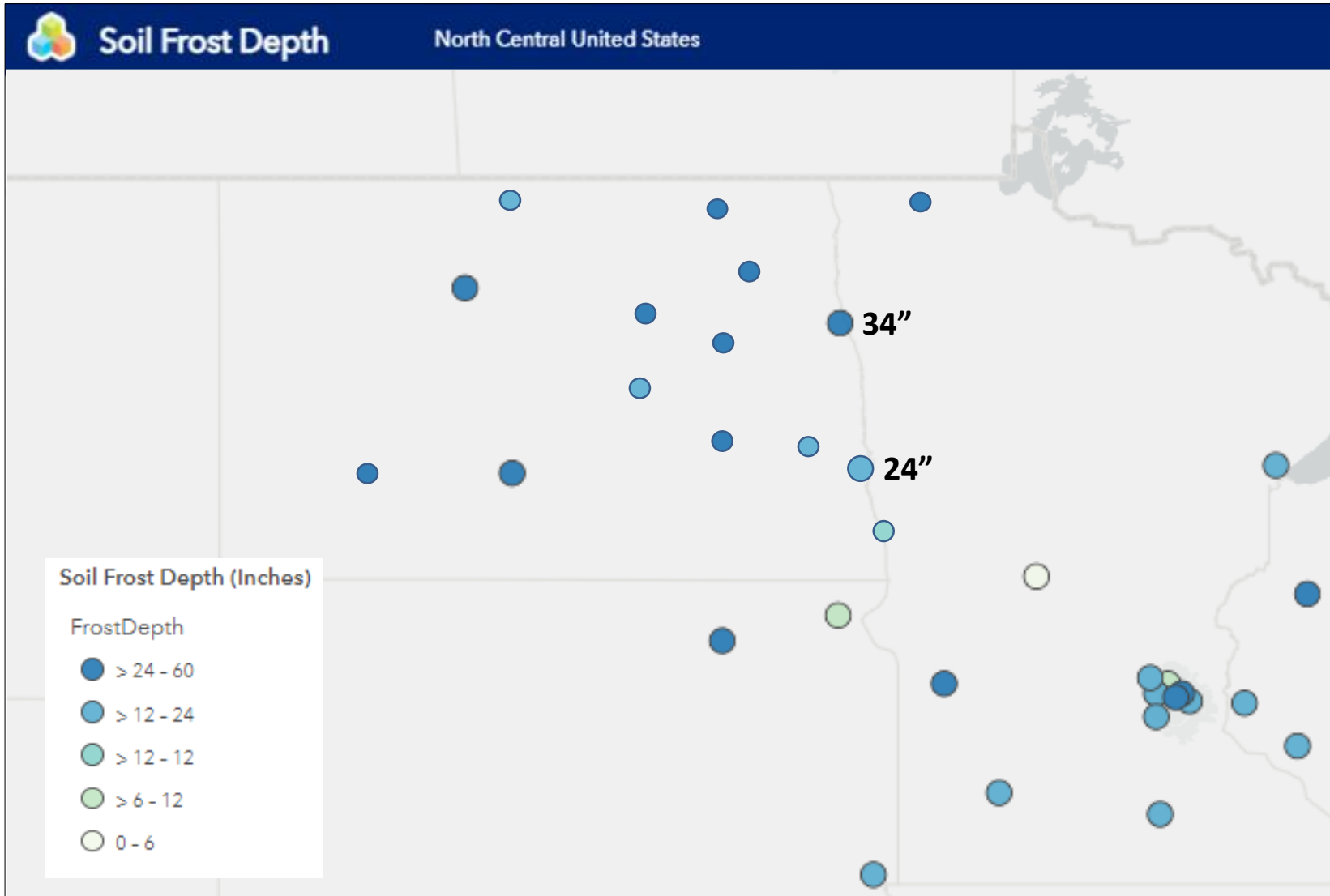
Red River Basin Spring Flood Ingredients

Spring Flooding ??



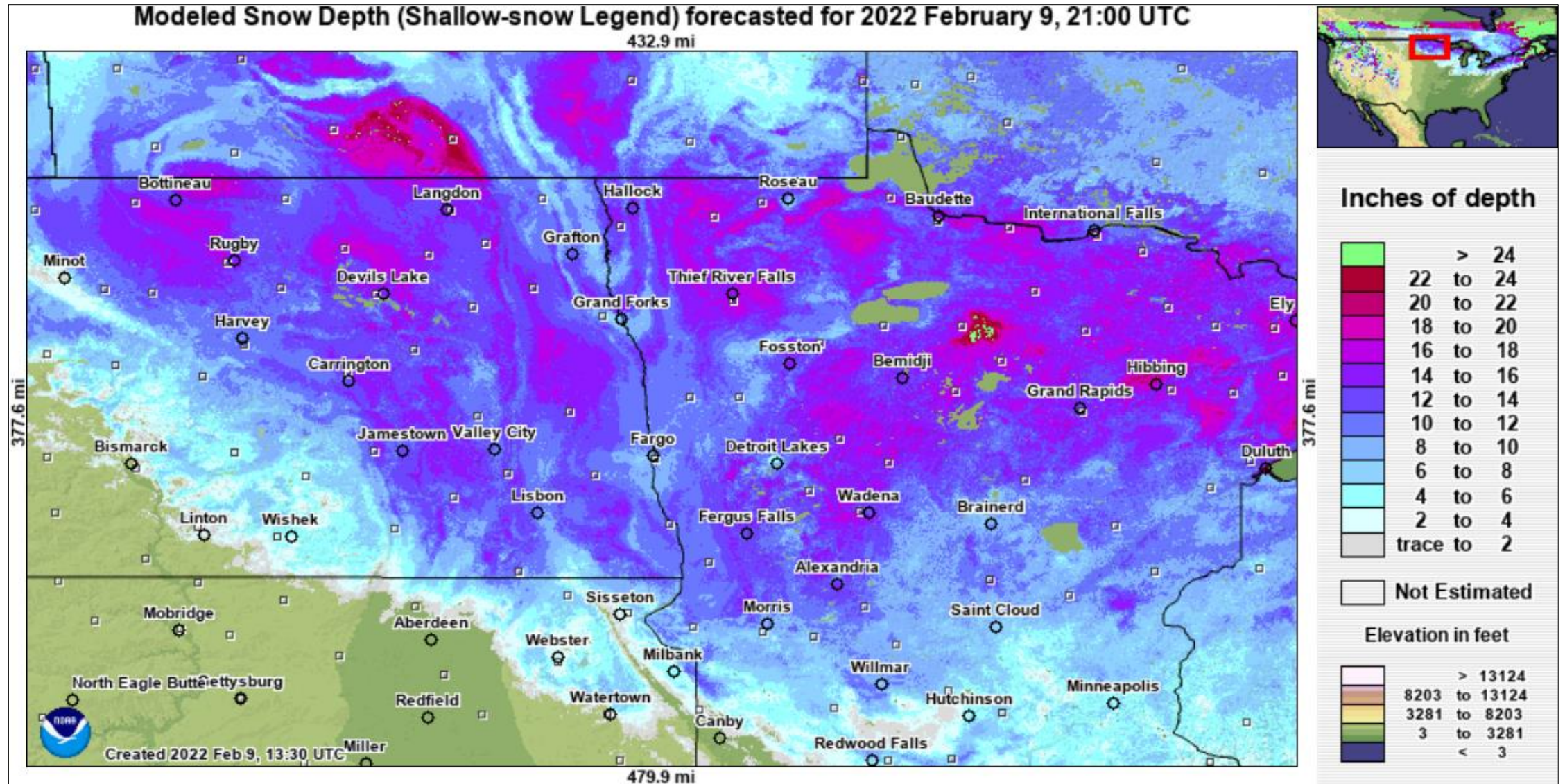
[Bluemle: Factors affecting flooding in the Red River Valley, 1997]

Frost Depths: Near to Deeper than Normal



- Despite the relatively warm start to winter, frost has penetrated fairly deep due to cold January and February conditions
- Normal to slightly deeper than normal
 - Generally 18 to nearly 50 inches deep
 - Not quite as deep in the far southern valley

Feb. 10th Snow Depth: Near to above Normal



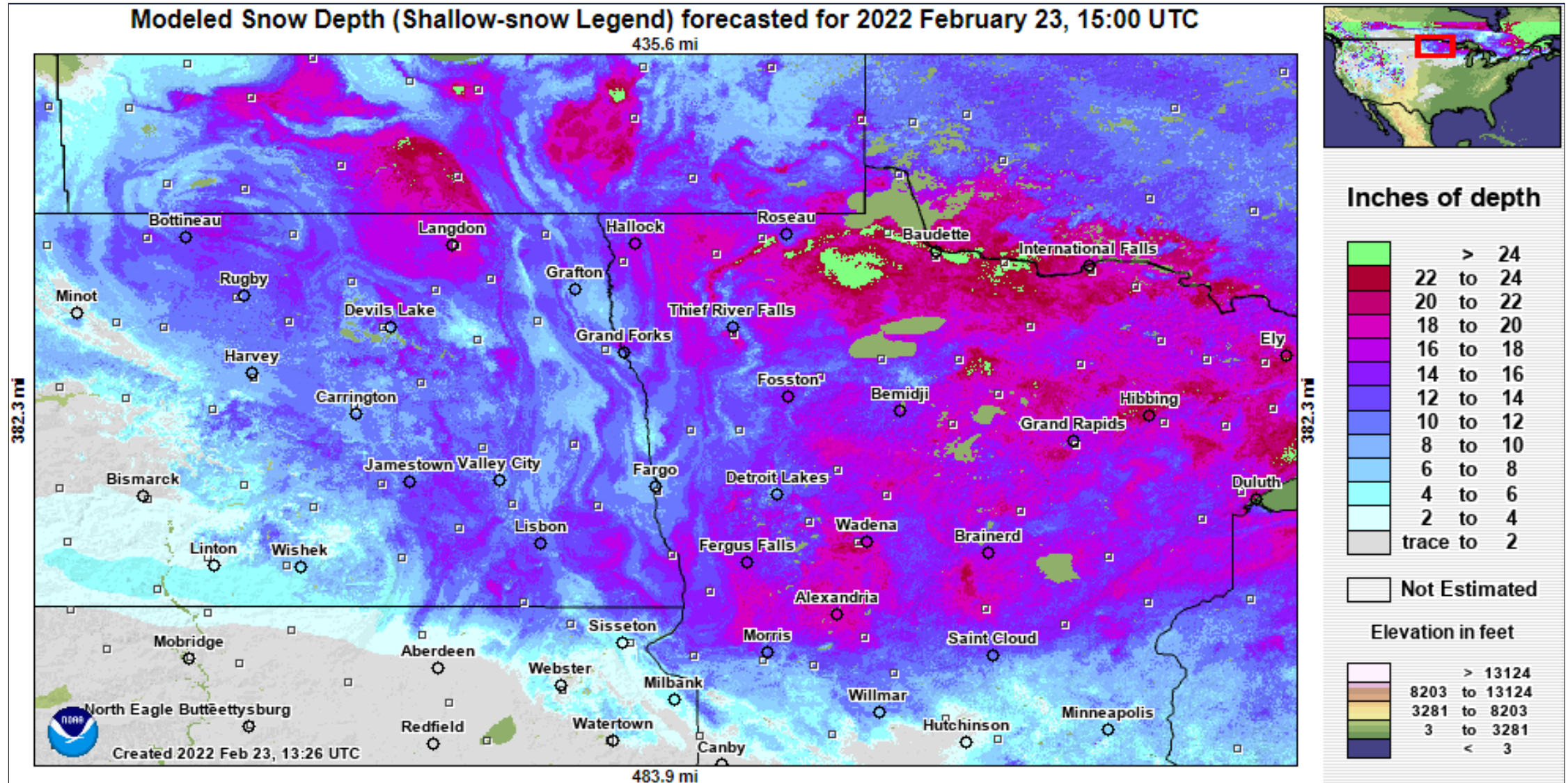
Roughly 6-20" across the basin

NWS Grand Forks: 12"

Fargo Observer: 8"

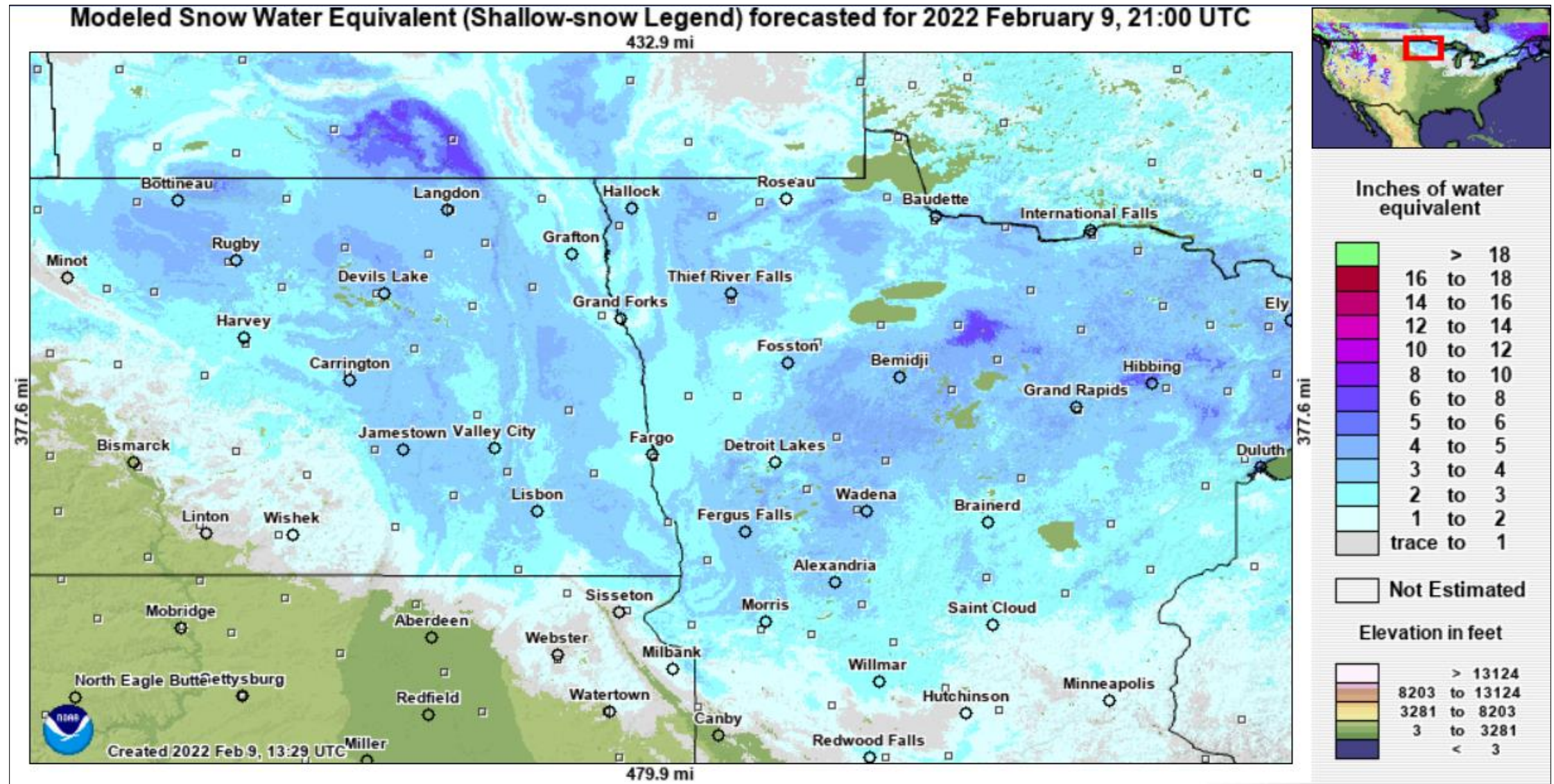
Data courtesy of NOHRSC

Feb. 24th Snow Depth: Generally Above Normal



Roughly 8-24+” across the basin | NWS Grand Forks: 8” | Fargo Observer: 9” | Wahp/Breck Observer: 19” Data courtesy of NOHRSC

Feb. 10th Snow Water Content: Near to above Normal



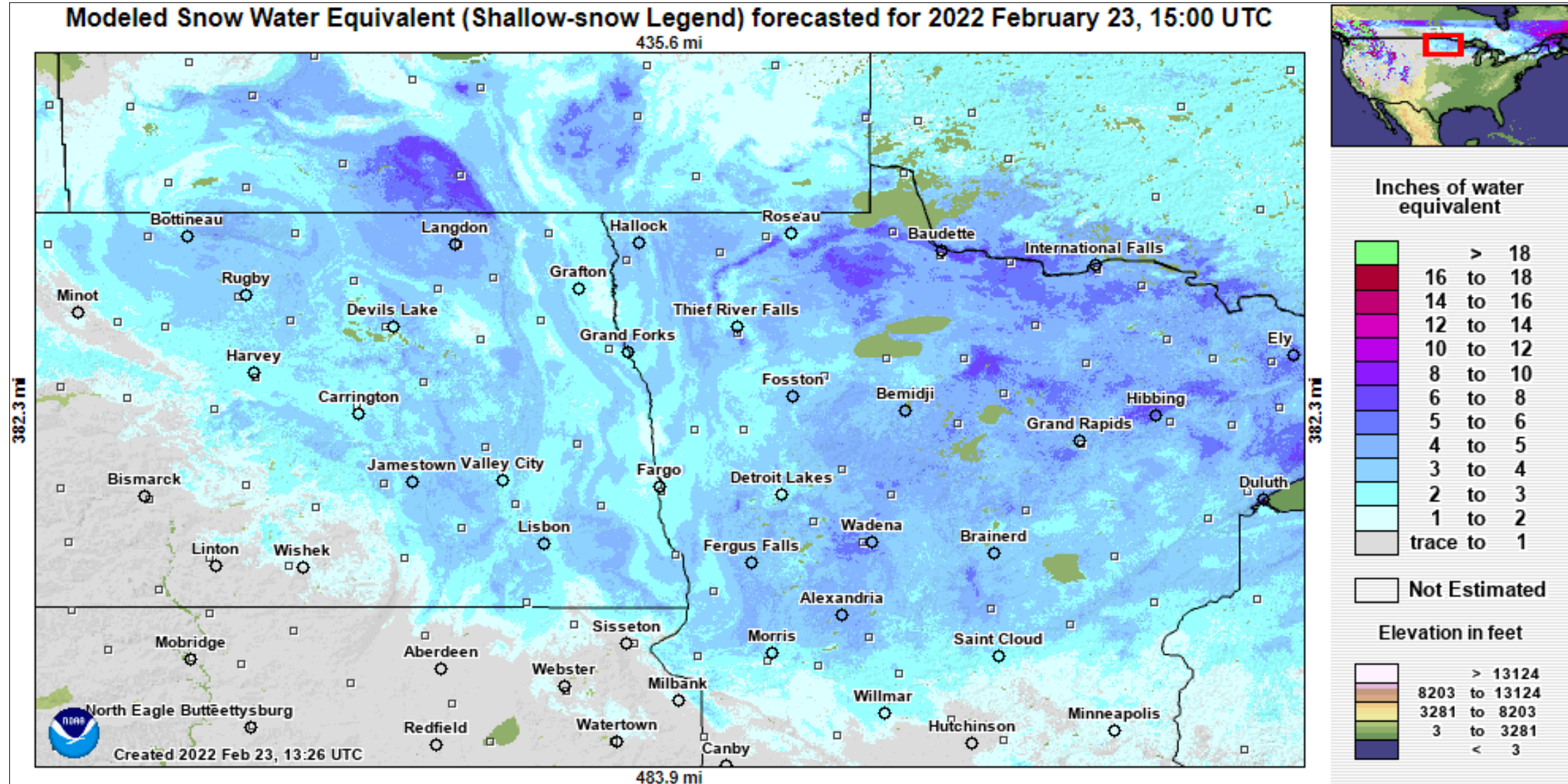
Roughly 2-4" across the basin

NWS Grand Forks: 3.3"

Fargo Observer: 1.9"

Data courtesy of NOHRSC

Feb. 24th Snow Water Content: Near to Above Normal



Roughly 2-5" across the basin

NWS Grand Forks: 2.6"

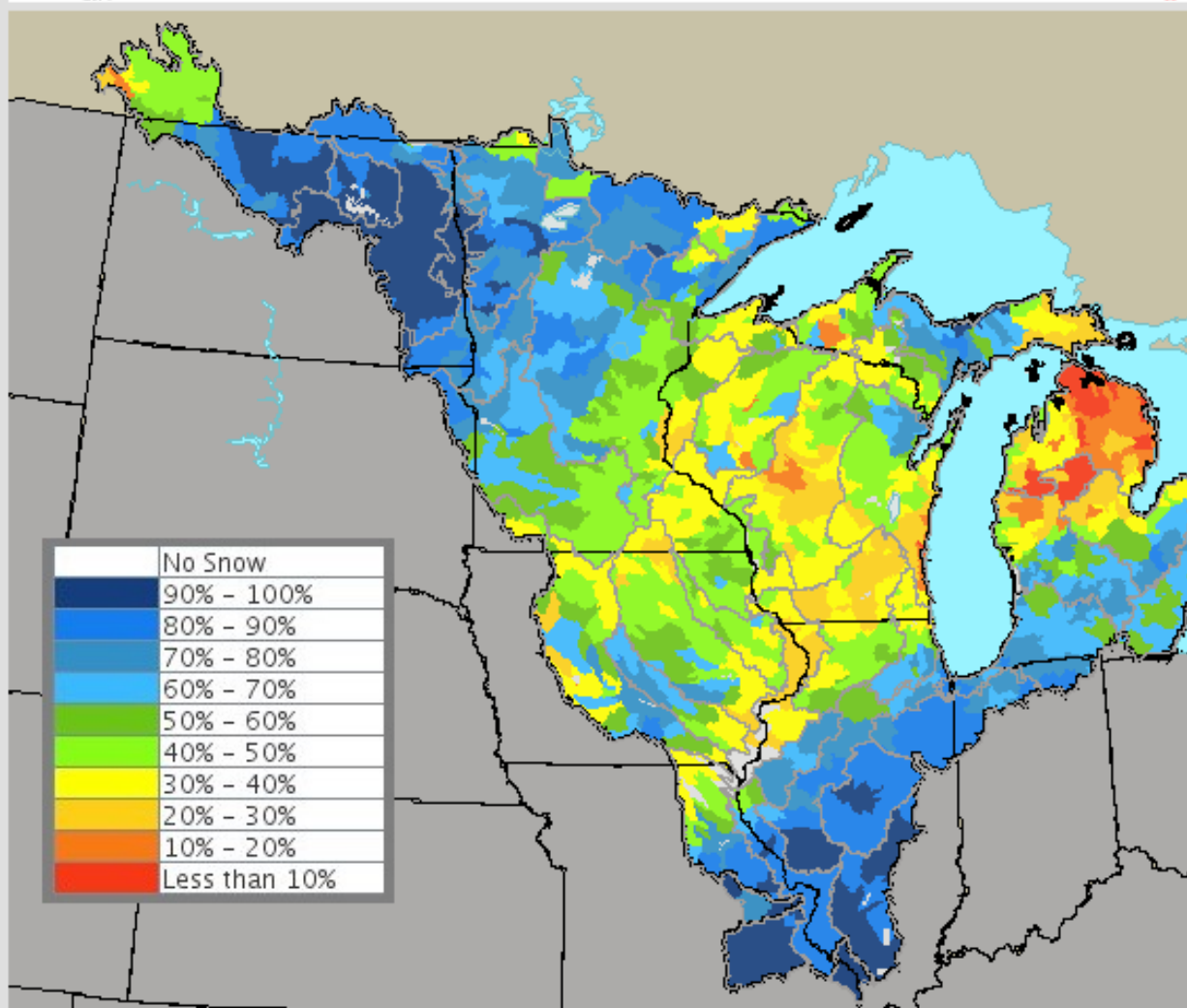
Wahp/Breck Observer: 4.2"

Data courtesy of NOHRSC



North Central River Forecast Center Ranked Simulated Snow Water Equivalent

Valid for 02/07/2022 12 GMT



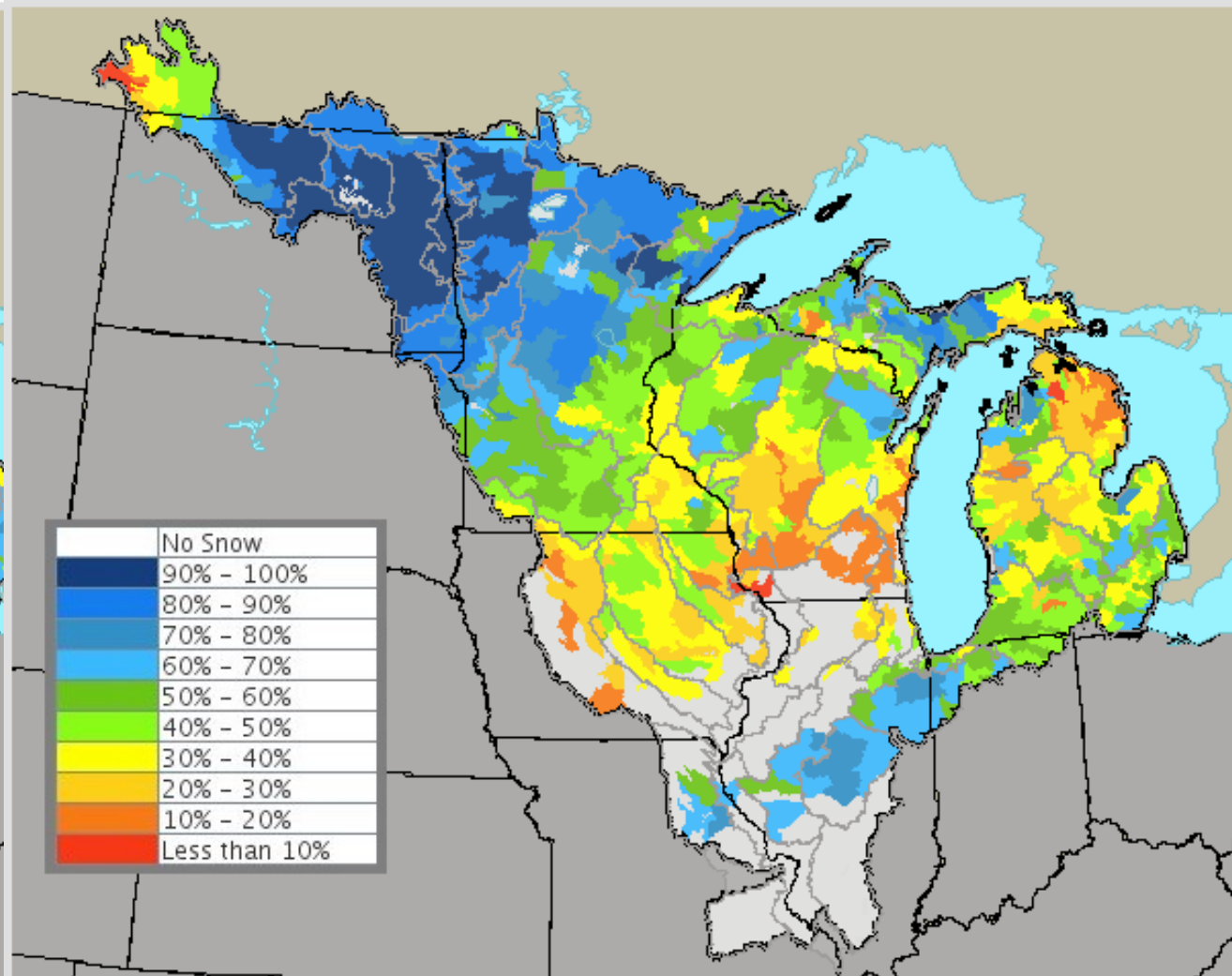
Note: This map compares current NCRFC Modeled SWE with the historical record of modeled SWE for each basin. An area ranked as 'Less than 10 percent' is at the lower end of the record and one ranked near 100 percent is at the higher end. A 50 percent ranking indicates current SWE is in the middle of our historical record.

Created on 02/08/2022 at 01:07:15



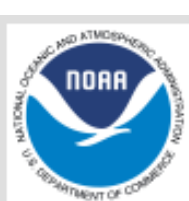
North Central River Forecast Center Ranked Simulated Snow Water Equivalent

Valid for 02/21/2022 12 GMT



Note: This map compares current NCRFC Modeled SWE with the historical record of modeled SWE for each basin. An area ranked as 'Less than 10 percent' is at the lower end of the record and one ranked near 100 percent is at the higher end. A 50 percent ranking indicates current SWE is in the middle of our historical record.

Created on 02/22/2022 at 01:07:51 AM CST



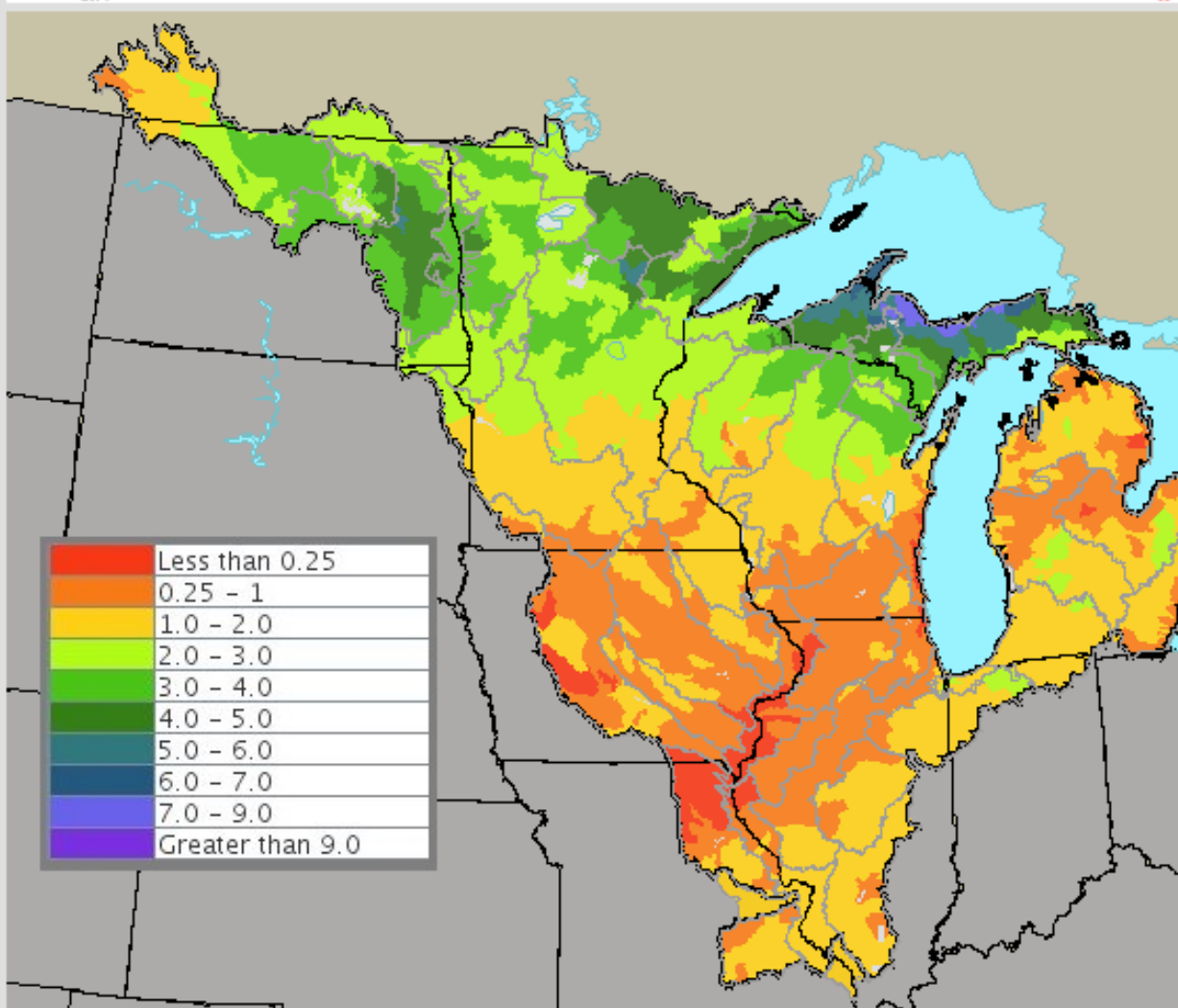
North Central River Forecast Center Model Simulated Snow Water Equivalent

Valid for 02/07/2022 12 GMT

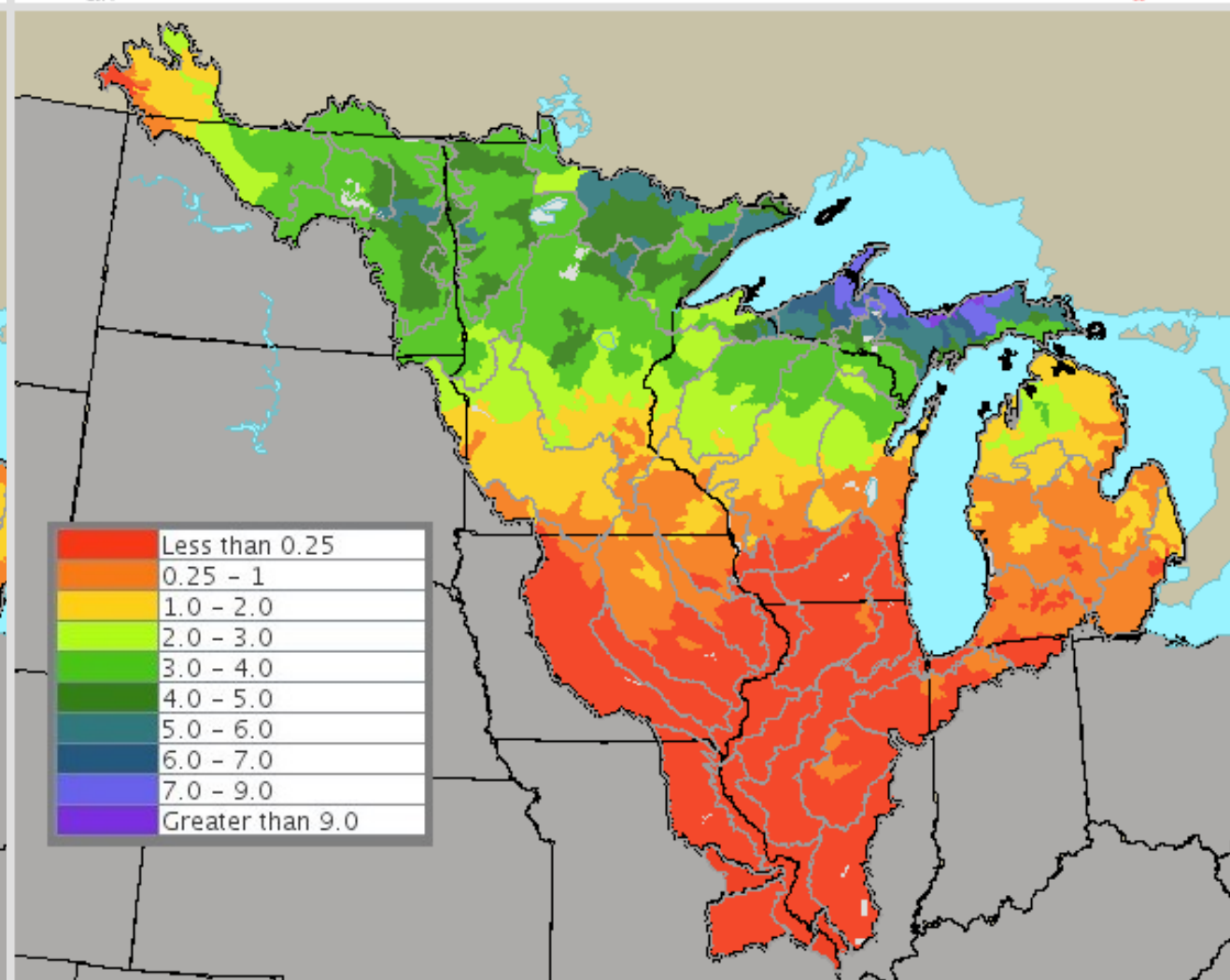


North Central River Forecast Center Model Simulated Snow Water Equivalent

Valid for 02/21/2022 12 GMT



Created on 02/08/2022 at 01:07:15



Created on 02/22/2022 at 01:07:51 AM CST

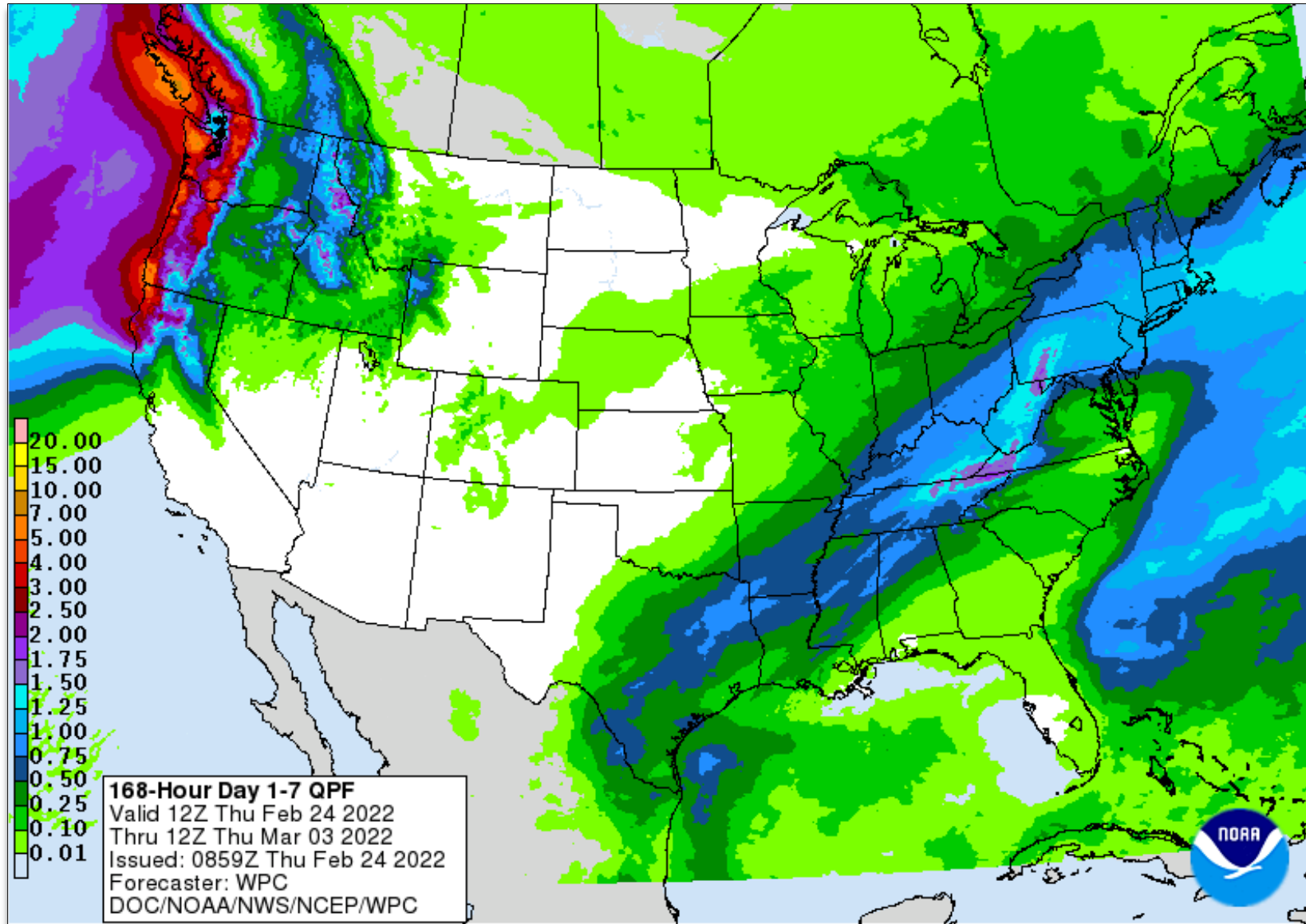
Red River Basin Spring Flood Ingredients

Spring Flooding ??



[Bluemle: Factors affecting flooding in the Red River Valley, 1997]

7-Day Forecast Precipitation Forecast (2/24-3/3)



CPC 8-14 Day Outlook



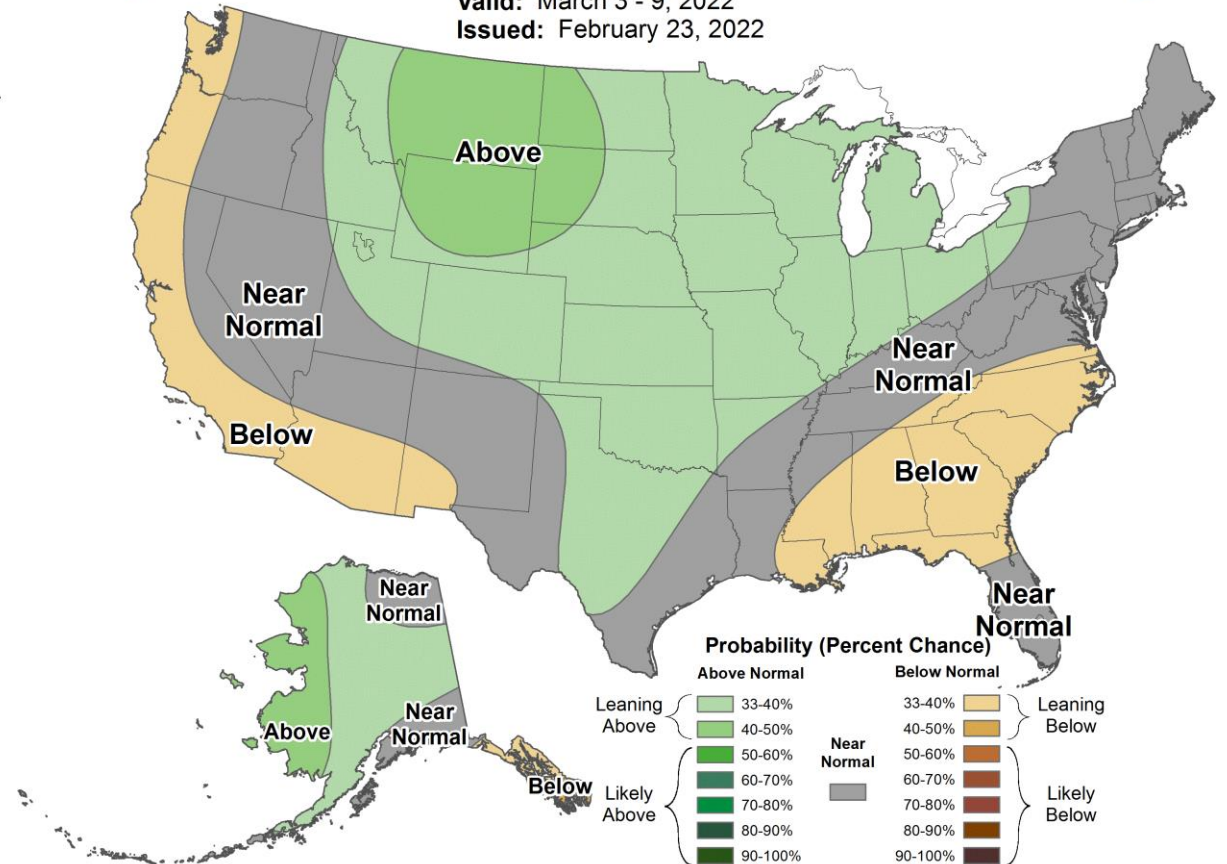
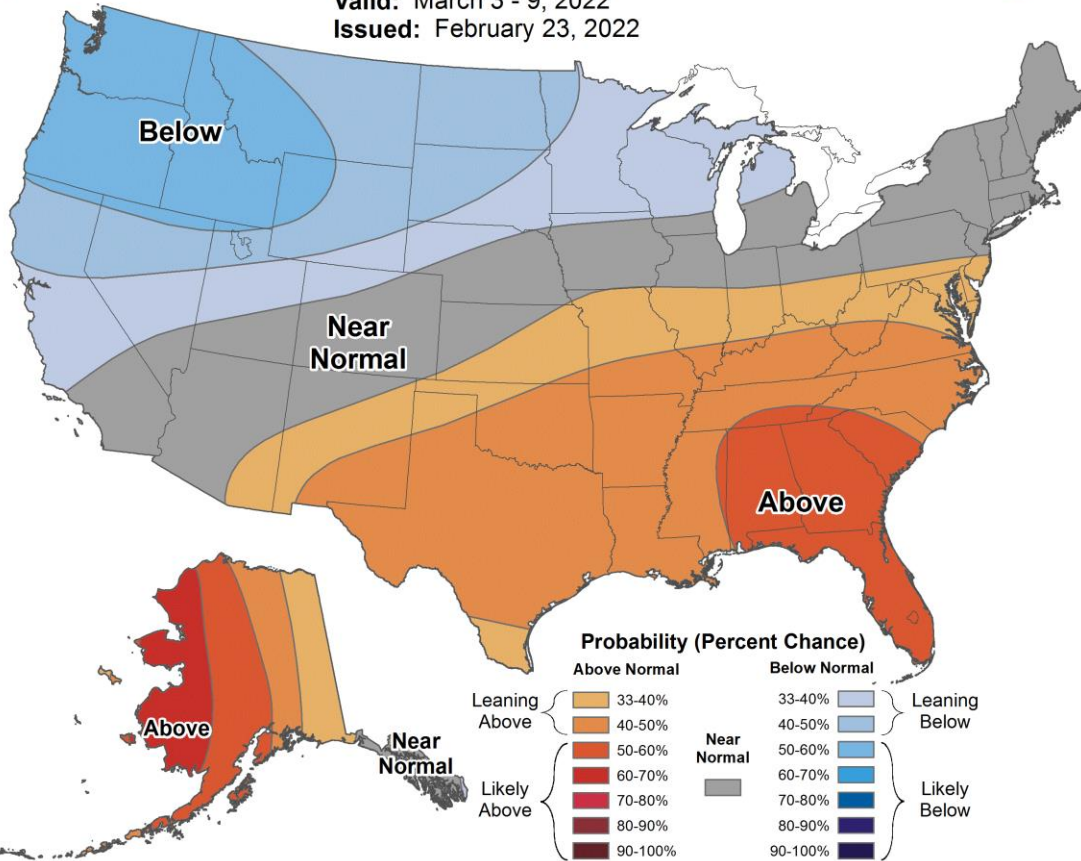
8-14 Day Temperature Outlook

Valid: March 3 - 9, 2022
Issued: February 23, 2022



8-14 Day Precipitation Outlook

Valid: March 3 - 9, 2022
Issued: February 23, 2022



Early March:

Increased chances for below normal temperatures and above normal precipitation.

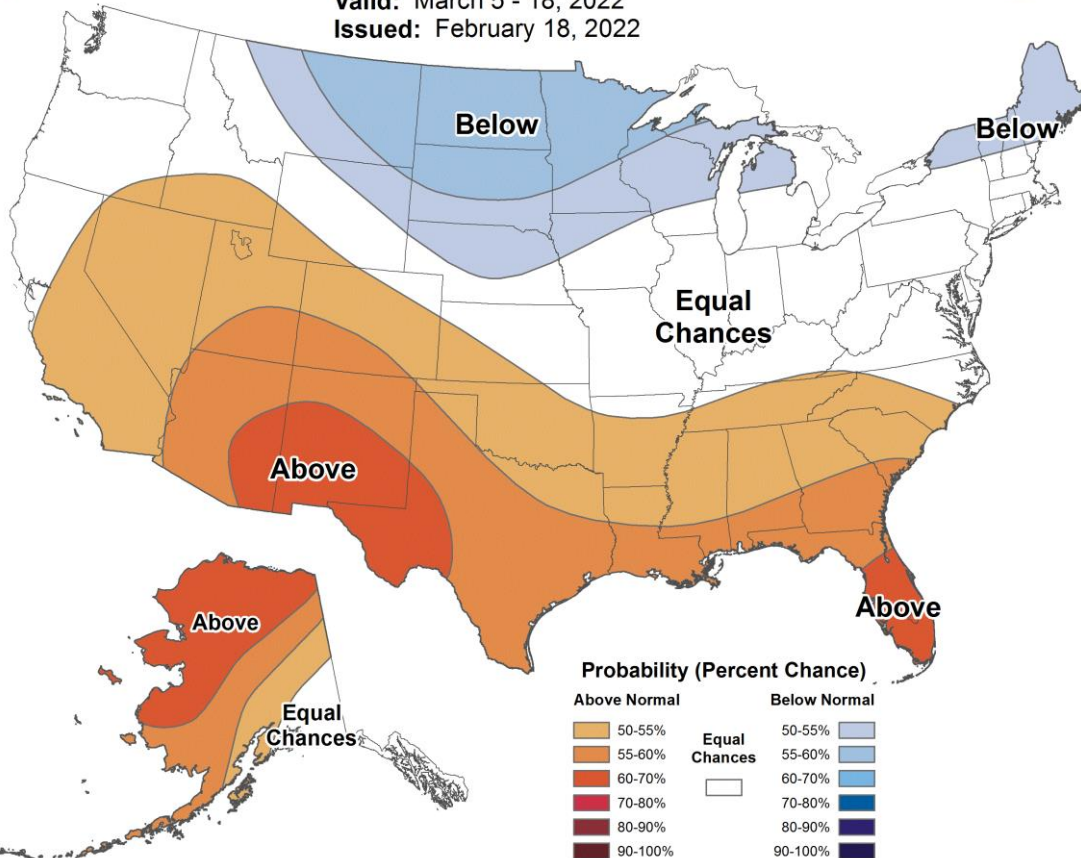
CPC Week 3-4 Outlook



Weeks 3-4 Temperature Outlook



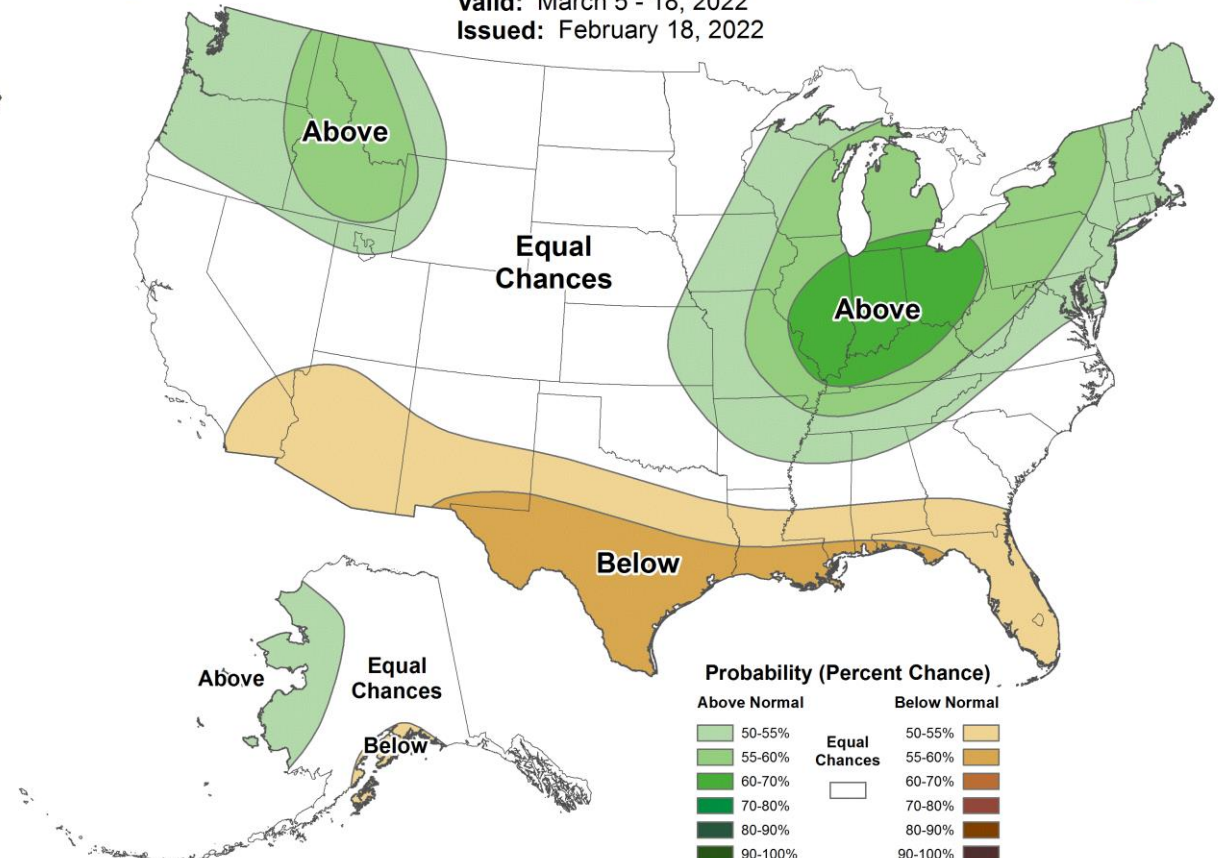
Valid: March 5 - 18, 2022
Issued: February 18, 2022



Weeks 3-4 Precipitation Outlook



Valid: March 5 - 18, 2022
Issued: February 18, 2022



Early to Mid March:

Increased chances for below normal temperatures with equal chances for below/normal/above precipitation.

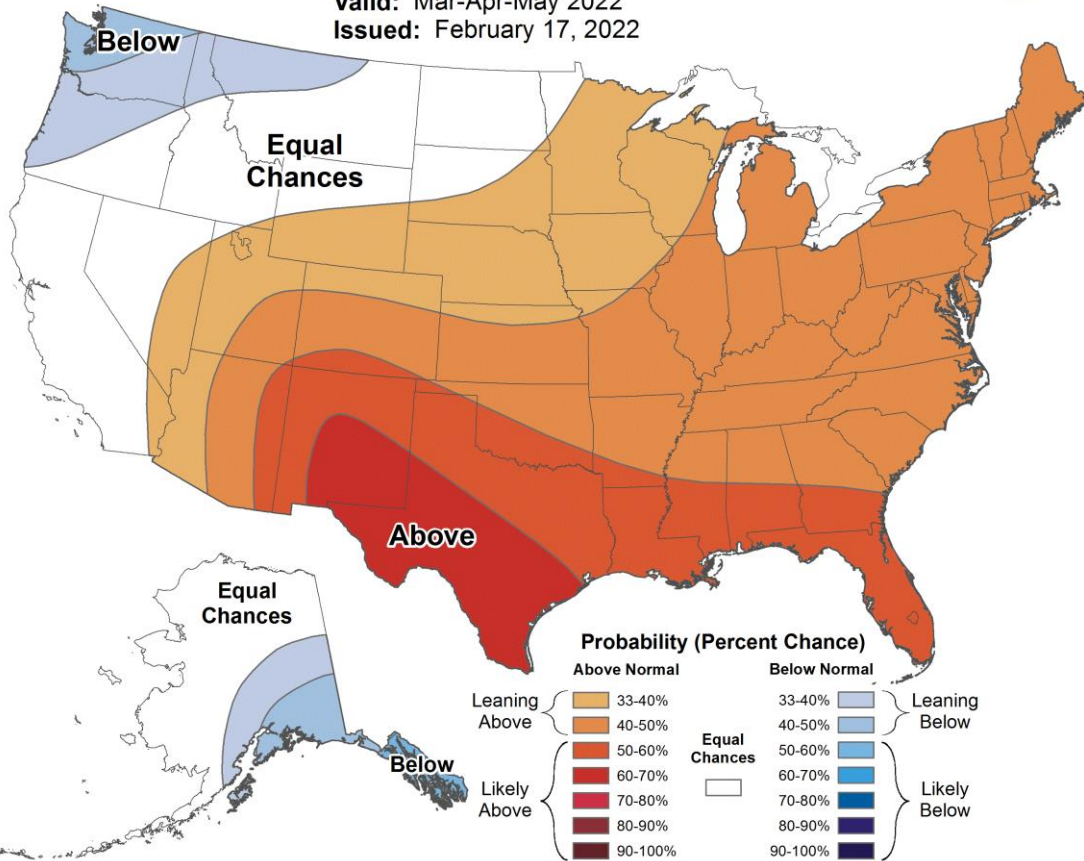
CPC March/April/May Outlook



Seasonal Temperature Outlook



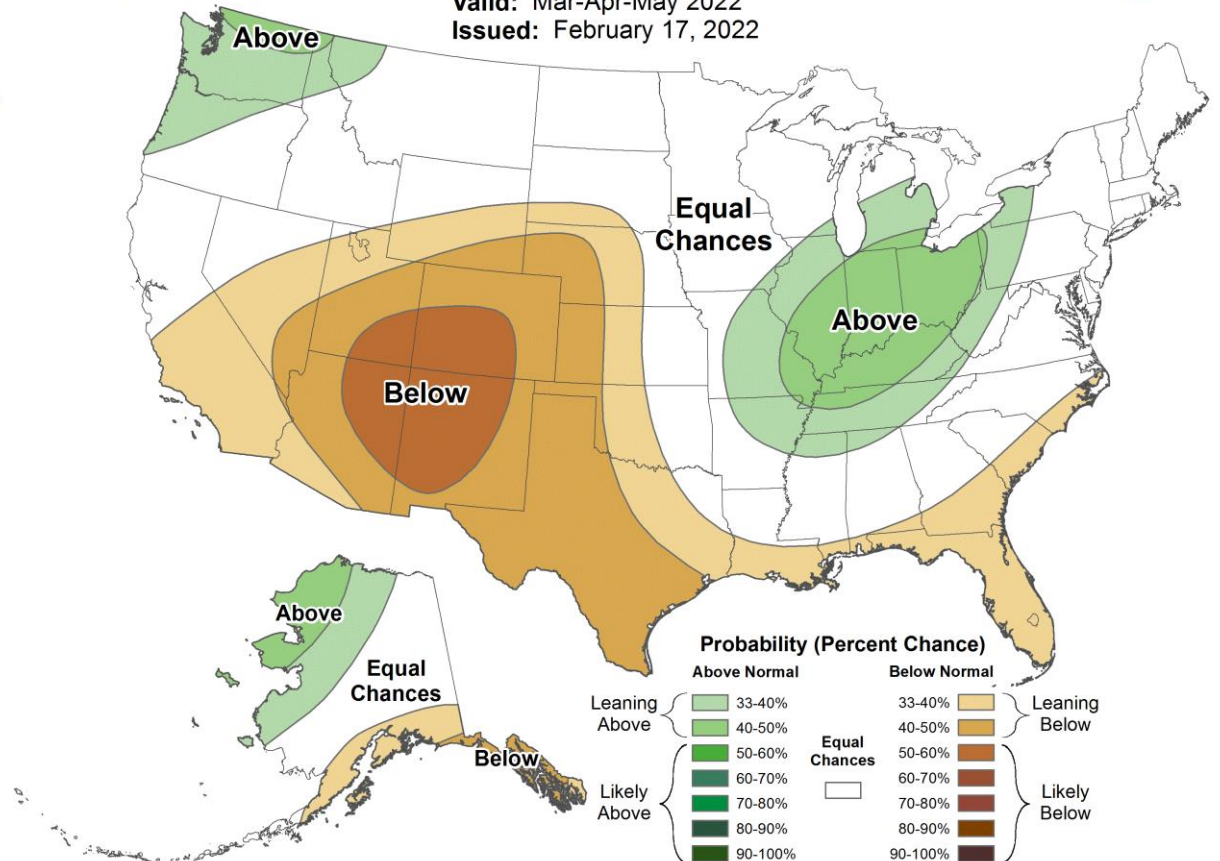
Valid: Mar-Apr-May 2022
Issued: February 17, 2022



Seasonal Precipitation Outlook

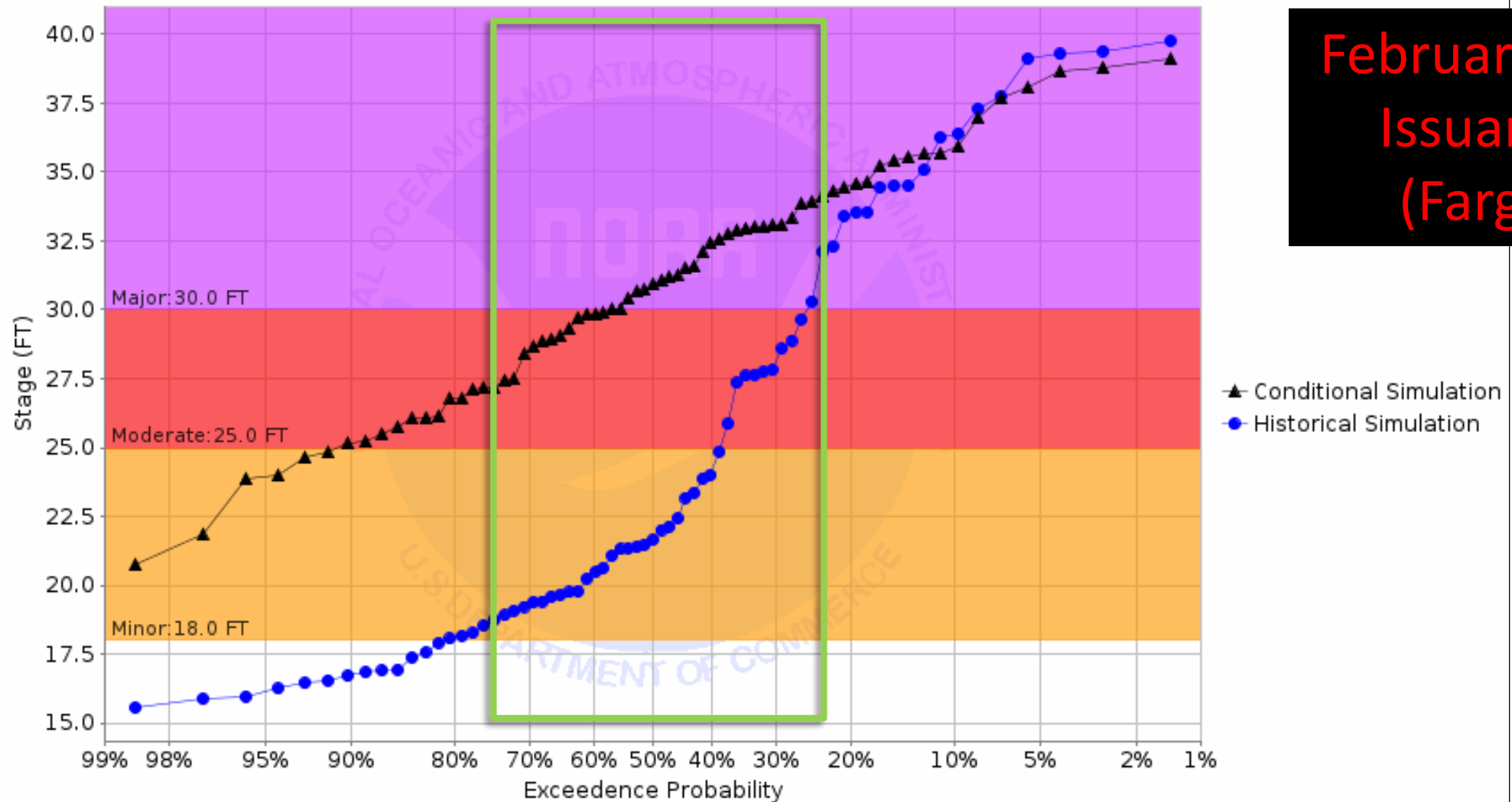


Valid: Mar-Apr-May 2022
Issued: February 17, 2022



Equal chances for below/normal/above temperatures and precipitation (i.e., no strong signal in any direction).

Chance of Exceeding River Stage at Red River of the North at Fargo WTP (FGON8)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022

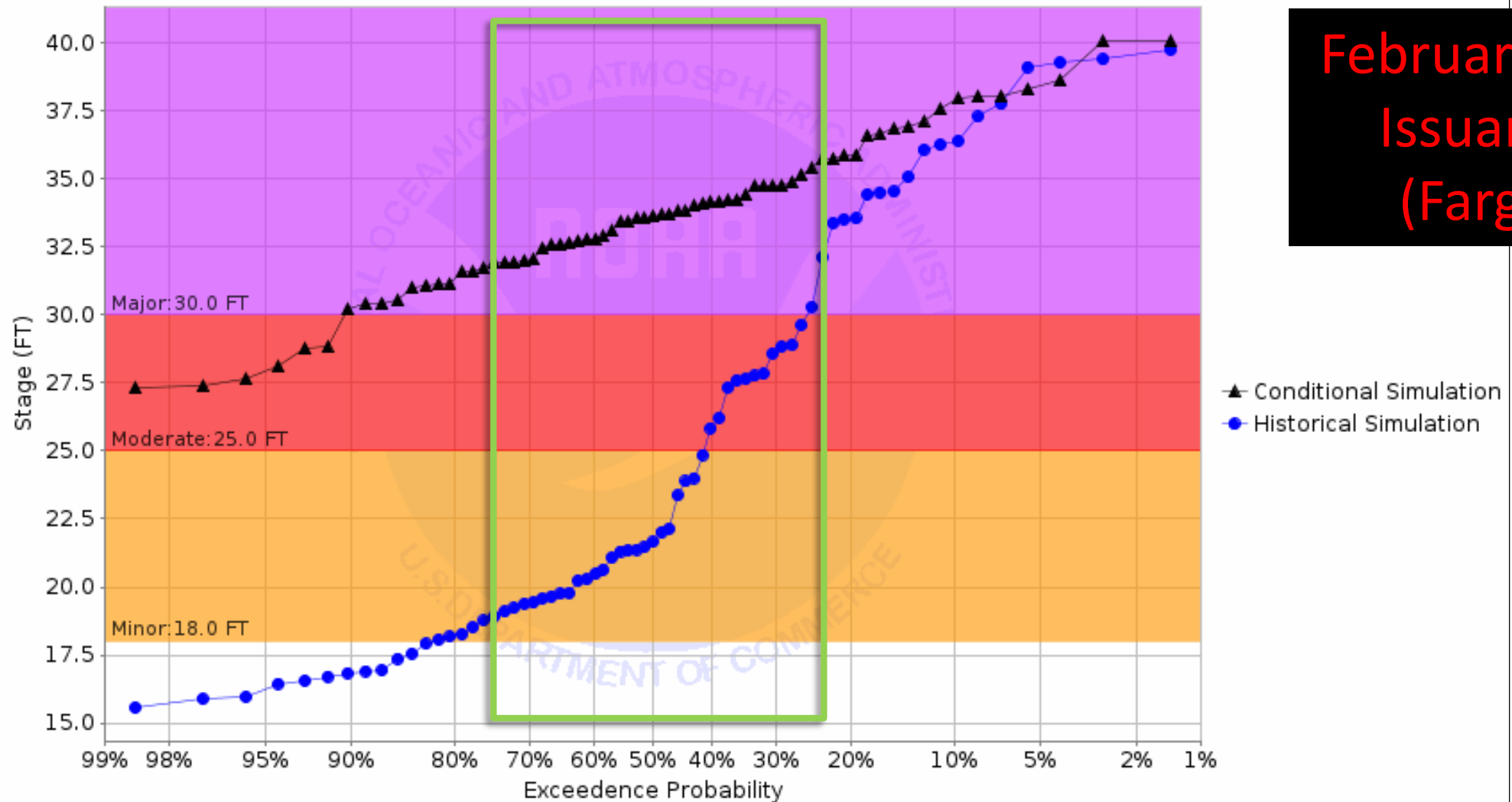


February 10th
Issuance
(Fargo)

With **near normal temperatures and precipitation** through the rest of winter and into spring,
moderate to **low end major** flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

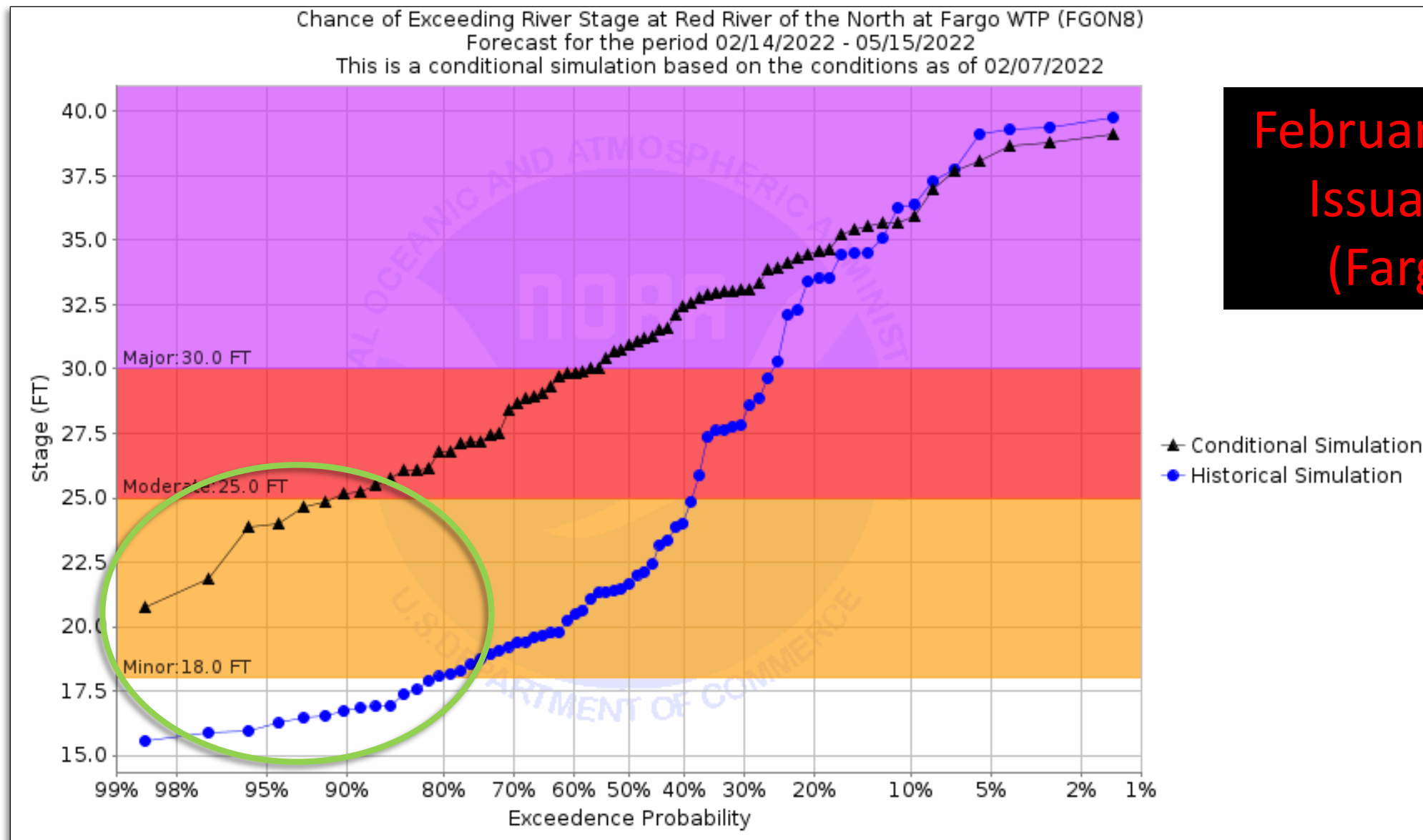
Chance of Exceeding River Stage at Red River of the North at Fargo WTP (FGON8)
Forecast for the period 02/28/2022 - 05/29/2022
This is a conditional simulation based on the conditions as of 02/21/2022



February 24th
Issuance
(Fargo)

With **near normal temperatures and precipitation** through the rest of winter and into spring,
major flooding is probable for **Fargo/Moorhead**.

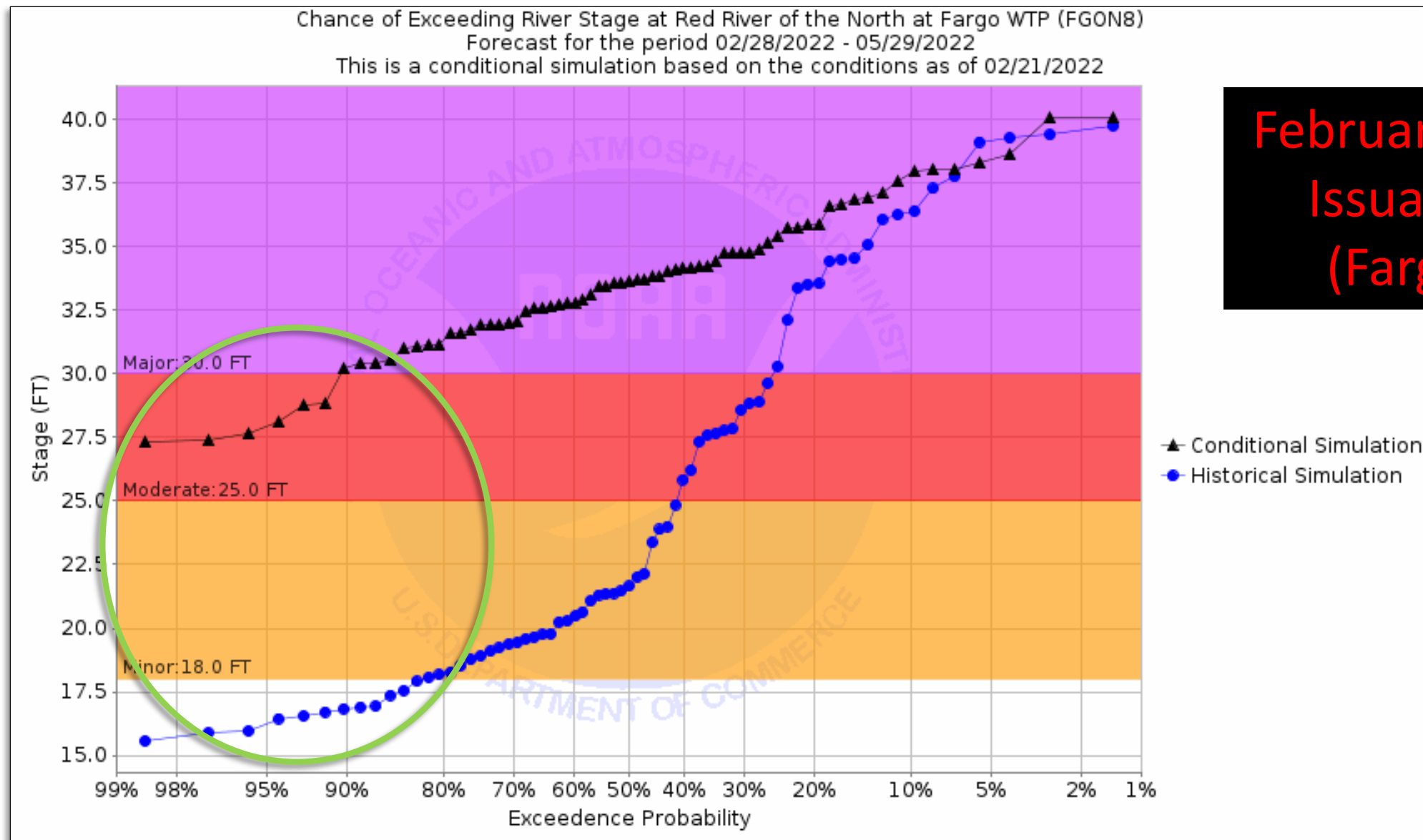
(Not taking into account precipitation type or melt rate.)



February 10th
Issuance
(Fargo)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, **minor to moderate** flooding is probable for **Fargo/Moorhead**.

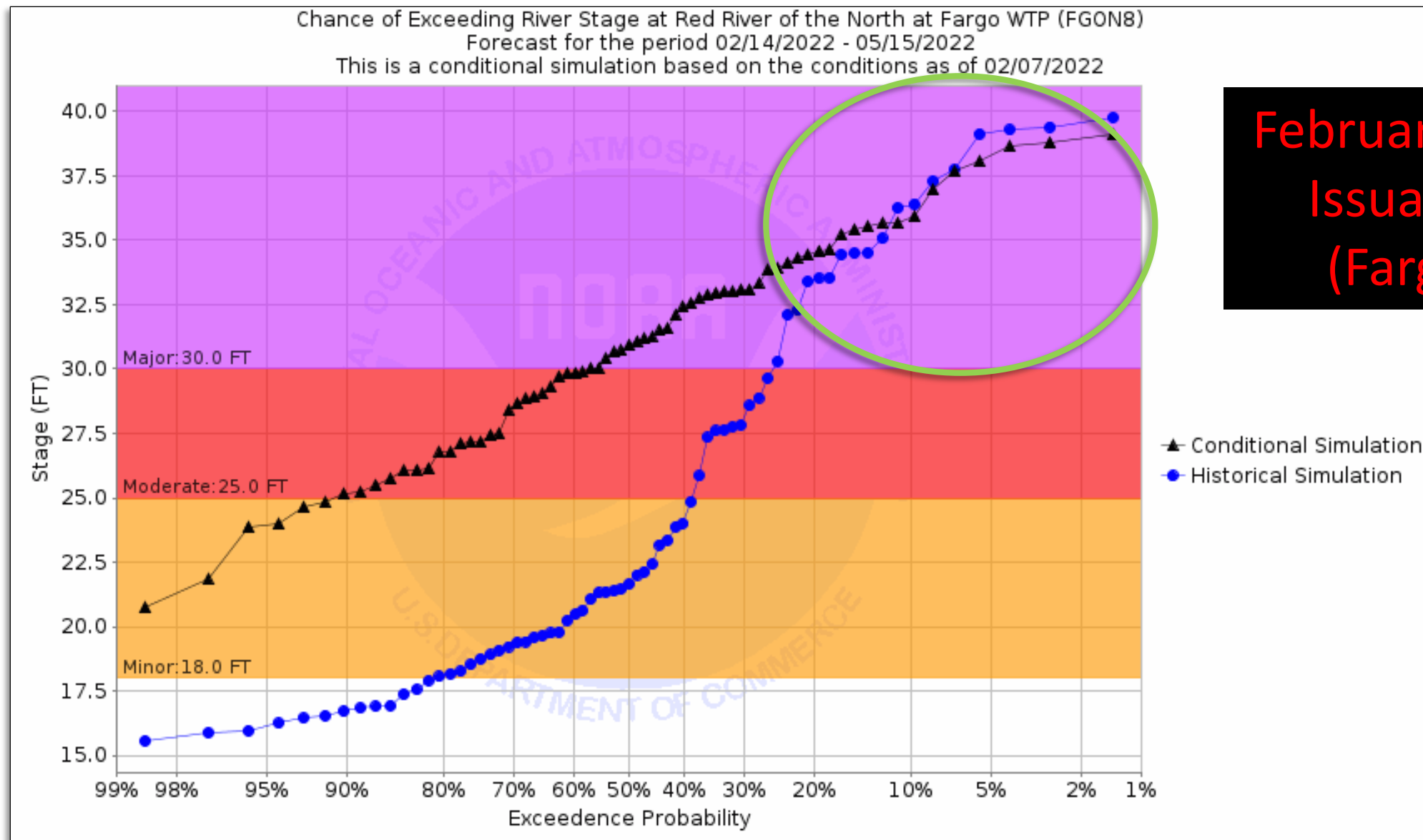
(Not taking into account precipitation type or melt rate.)



February 24th
Issuance
(Fargo)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, ***moderate to low end major*** flooding is probable for **Fargo/Moorhead**.

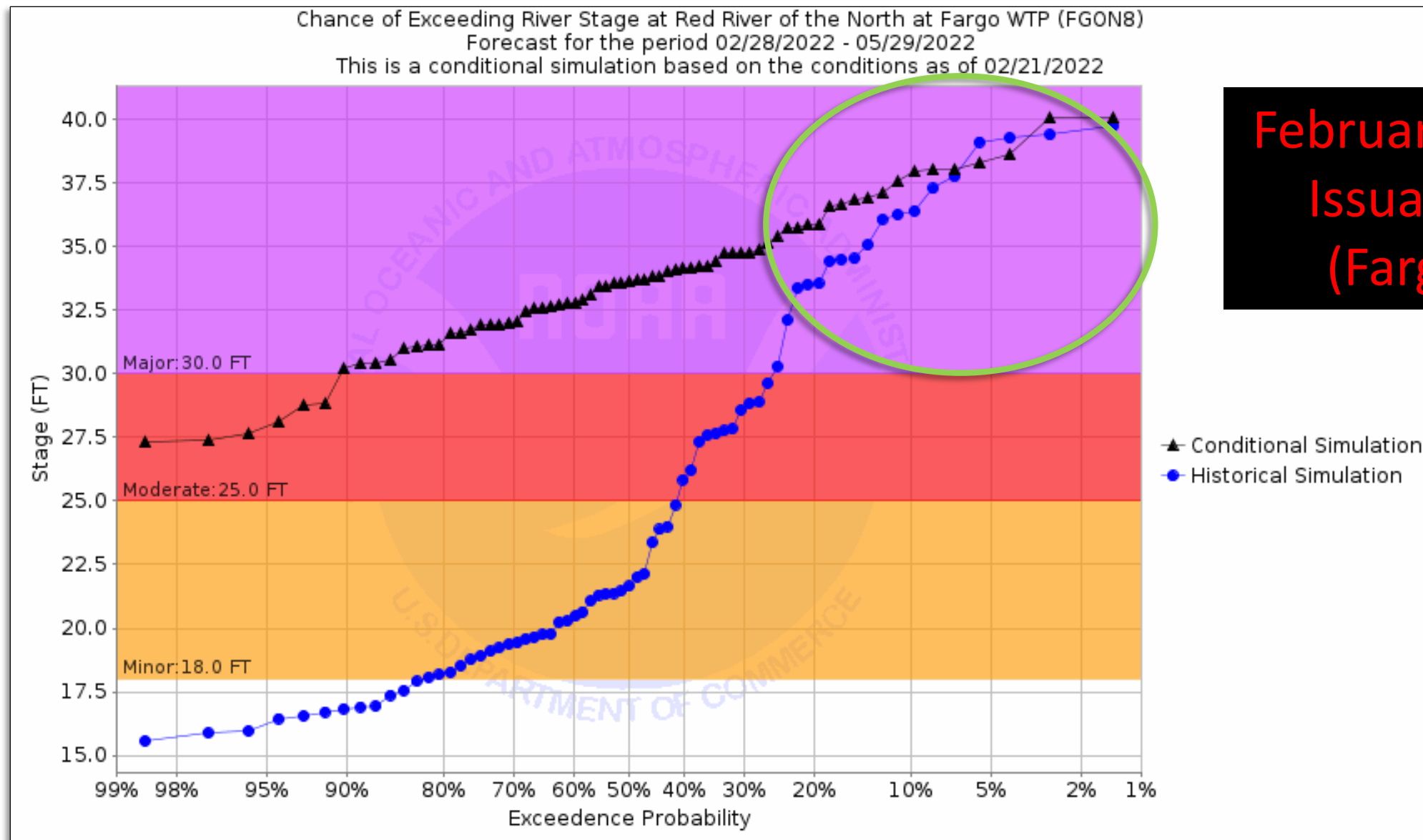
(Not taking into account precipitation type or melt rate.)



February 10th
Issuance
(Fargo)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

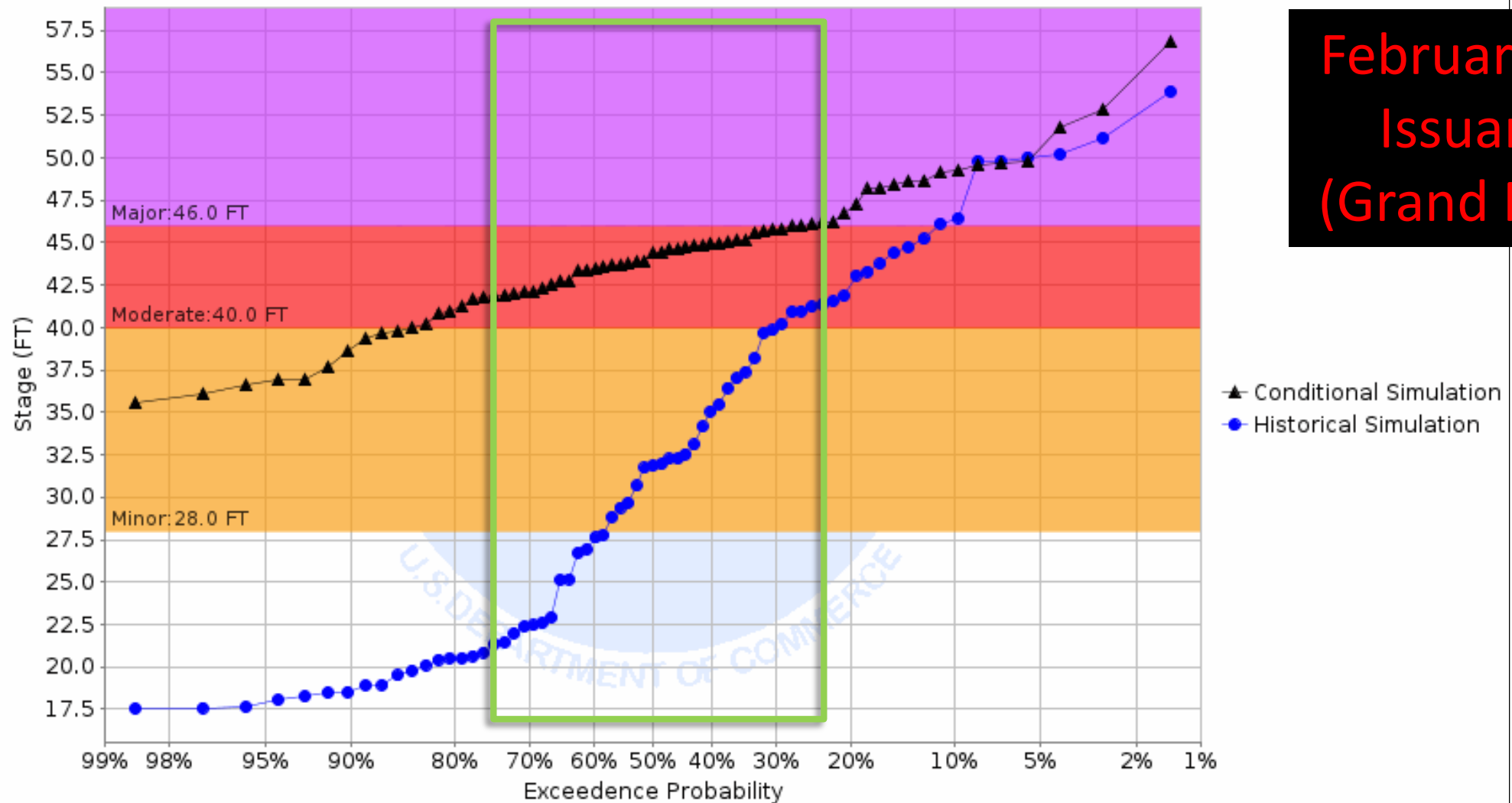


February 24th
Issuance
(Fargo)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022

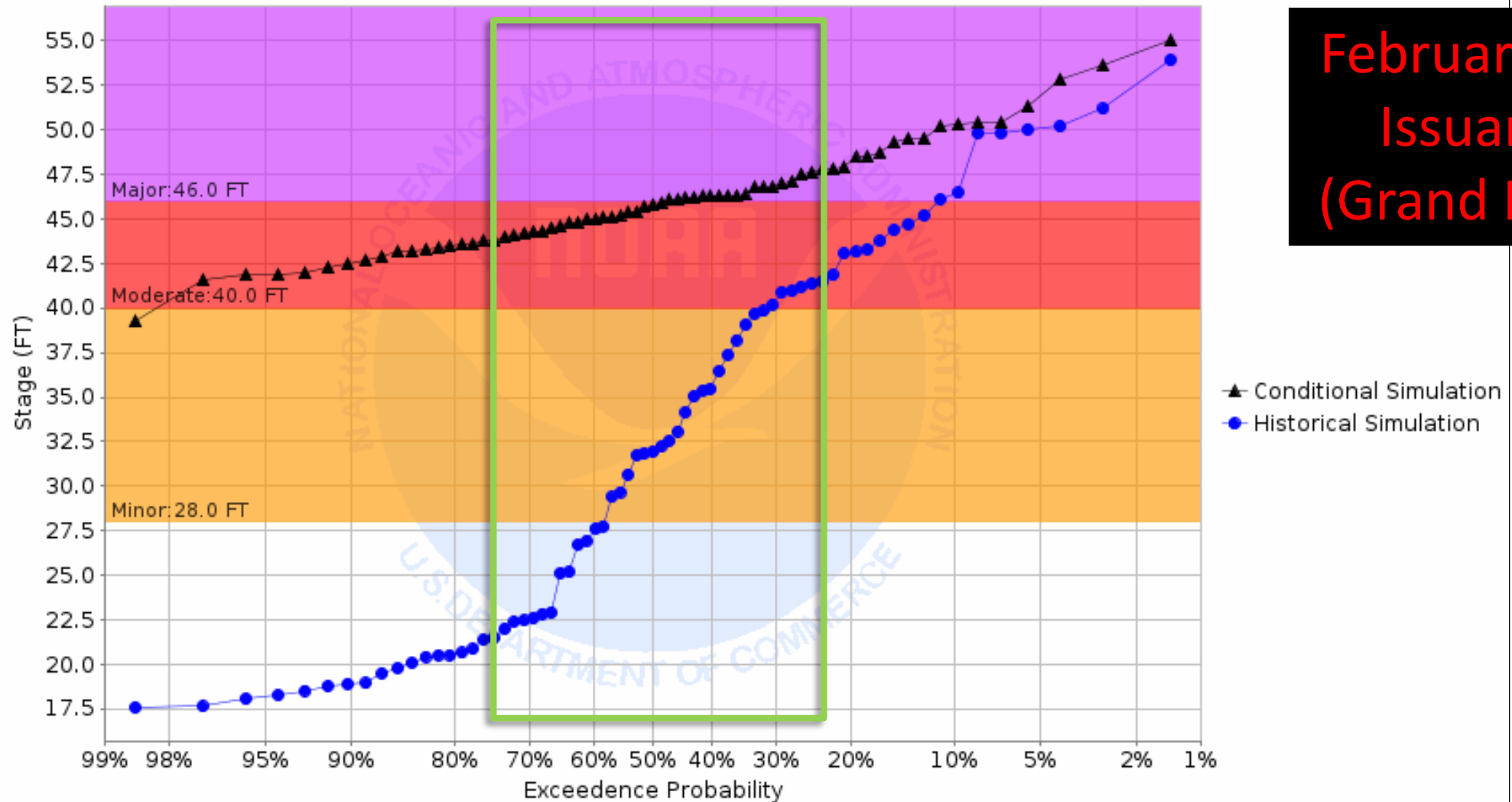


February 10th
Issuance
(Grand Forks)

With **near normal temperatures and precipitation** through the rest of winter and into spring,
moderate flooding is probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)

Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 02/28/2022 - 05/29/2022
This is a conditional simulation based on the conditions as of 02/21/2022

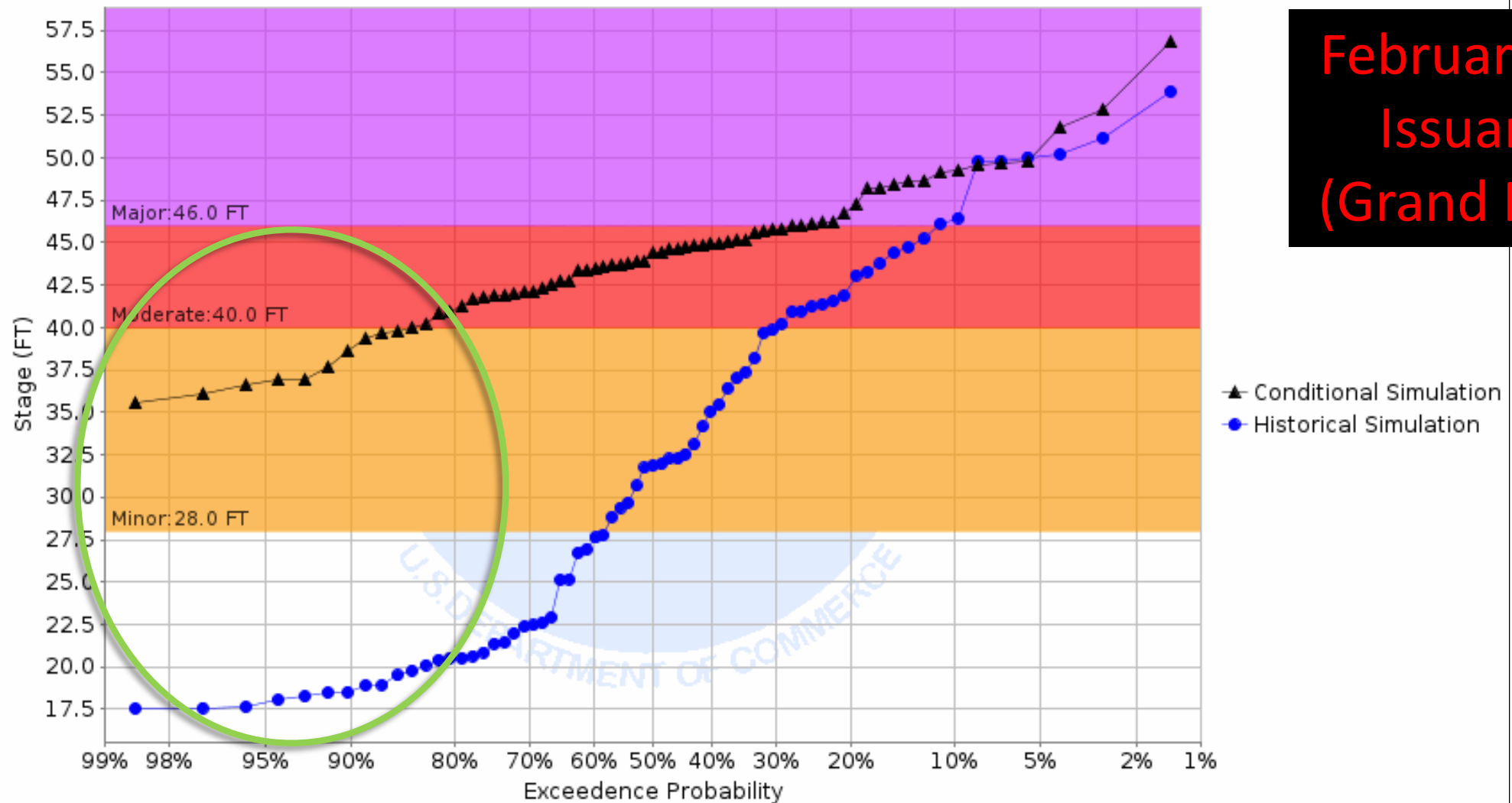


February 24th
Issuance
(Grand Forks)

With **near normal temperatures and precipitation** through the rest of winter and into spring, ***moderate*** flooding is probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)

Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022

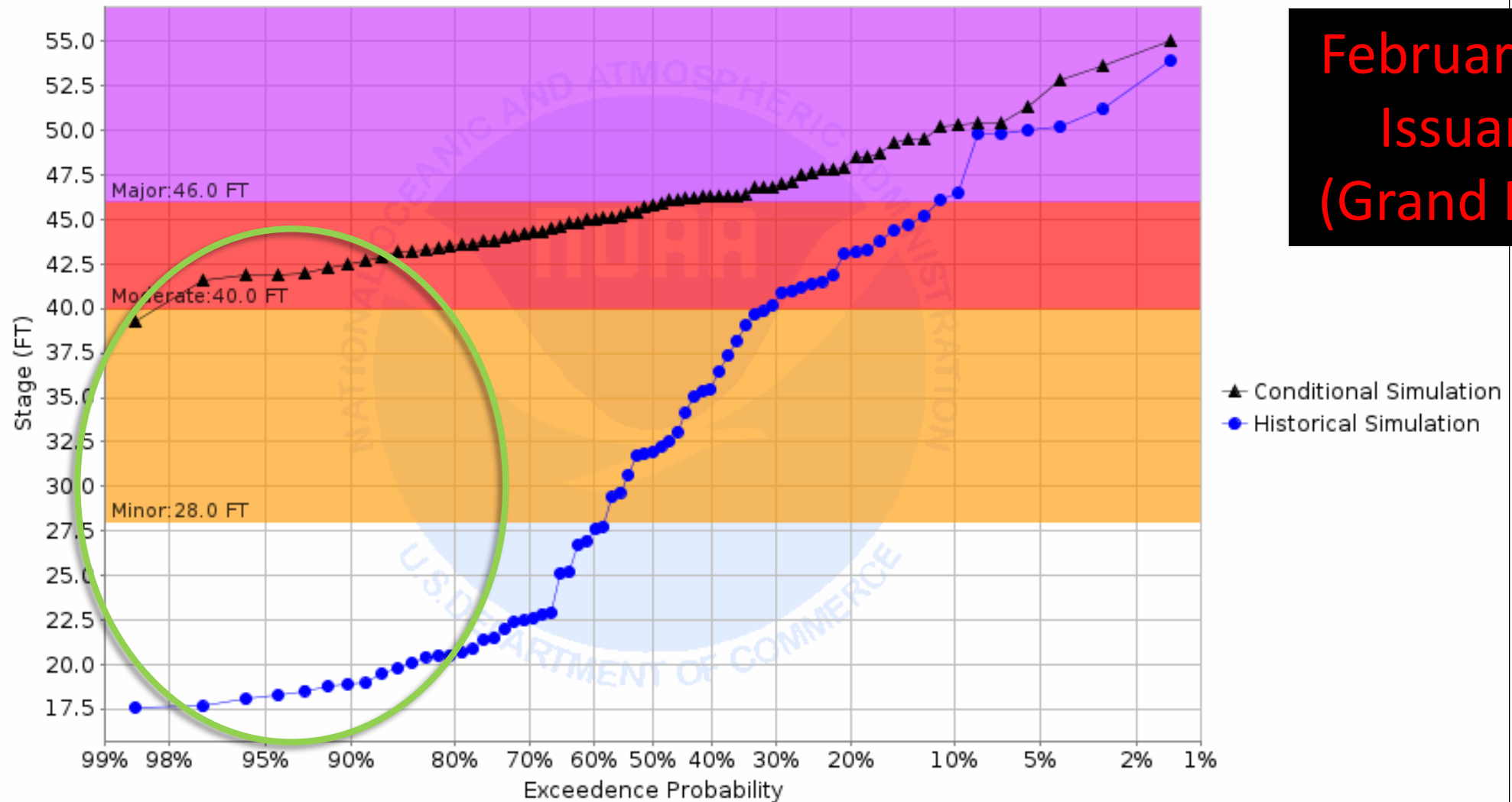


February 10th
Issuance
(Grand Forks)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, **minor** flooding is probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)

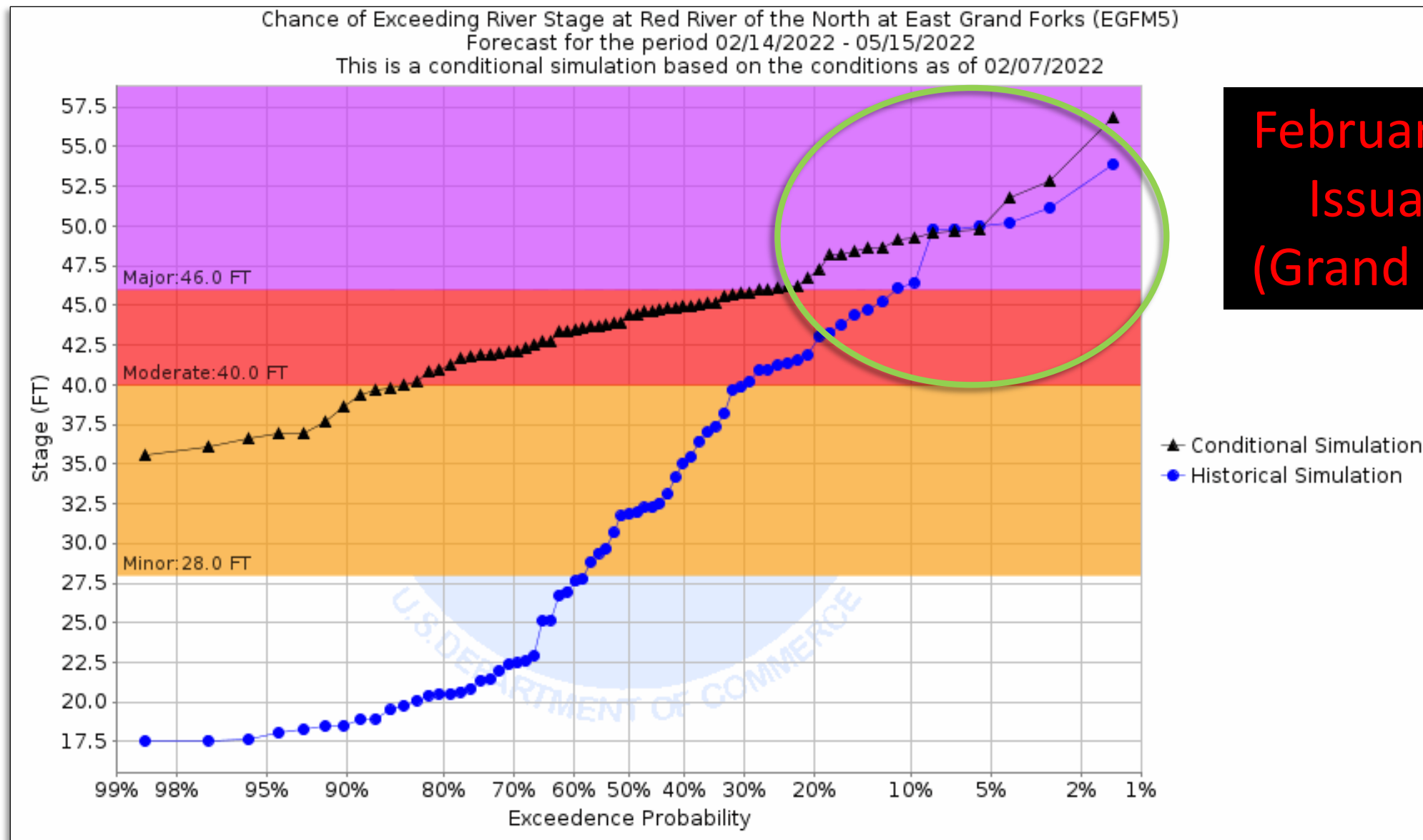
Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 02/28/2022 - 05/29/2022
This is a conditional simulation based on the conditions as of 02/21/2022



February 24th
Issuance
(Grand Forks)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, ***moderate*** flooding is probable for **Grand Forks/East Grand Forks**.

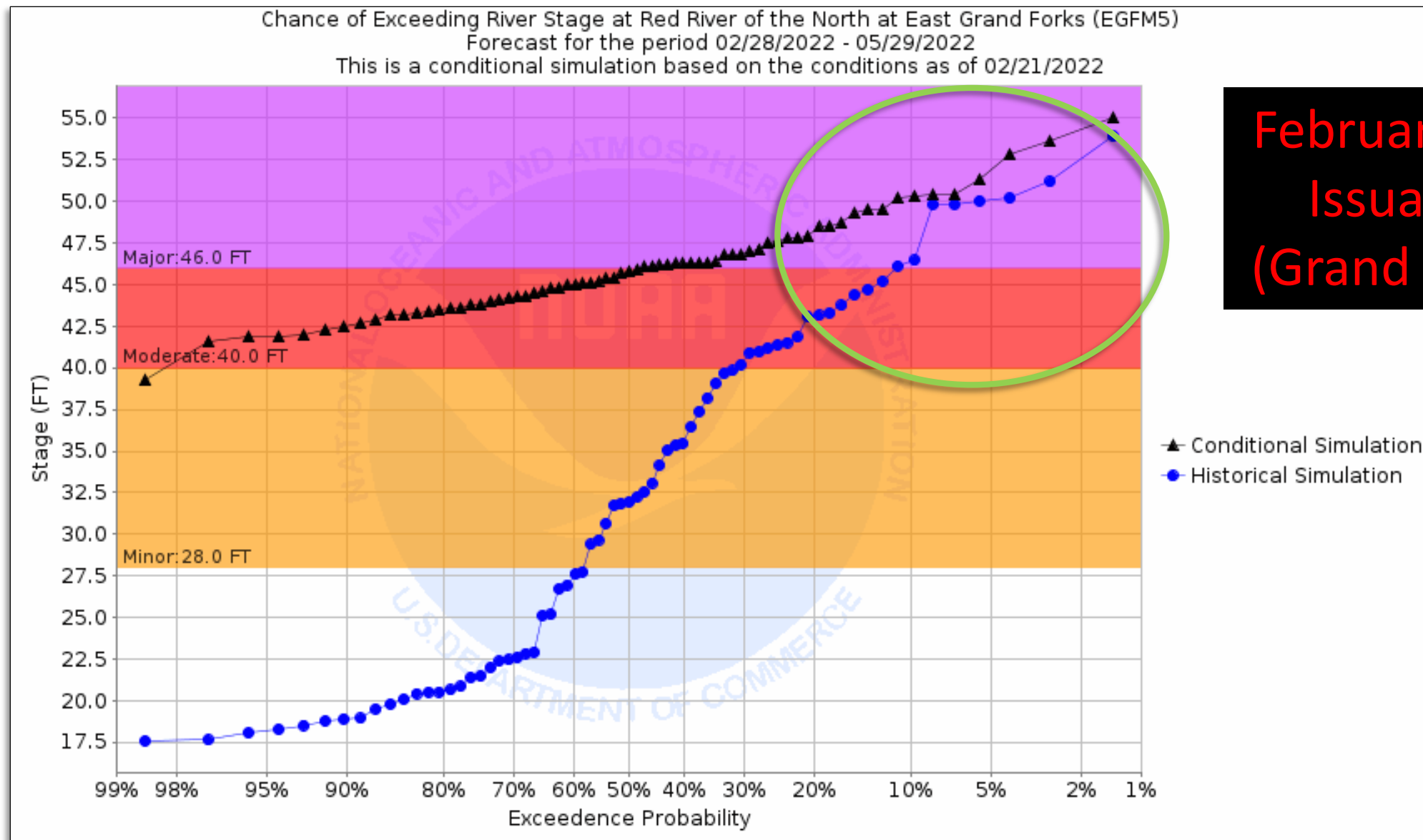
(Not taking into account precipitation type or melt rate.)



February 10th
Issuance
(Grand Forks)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is most probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)



February 24th
Issuance
(Grand Forks)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, **major** flooding is most probable for **Grand Forks/East Grand Forks**.

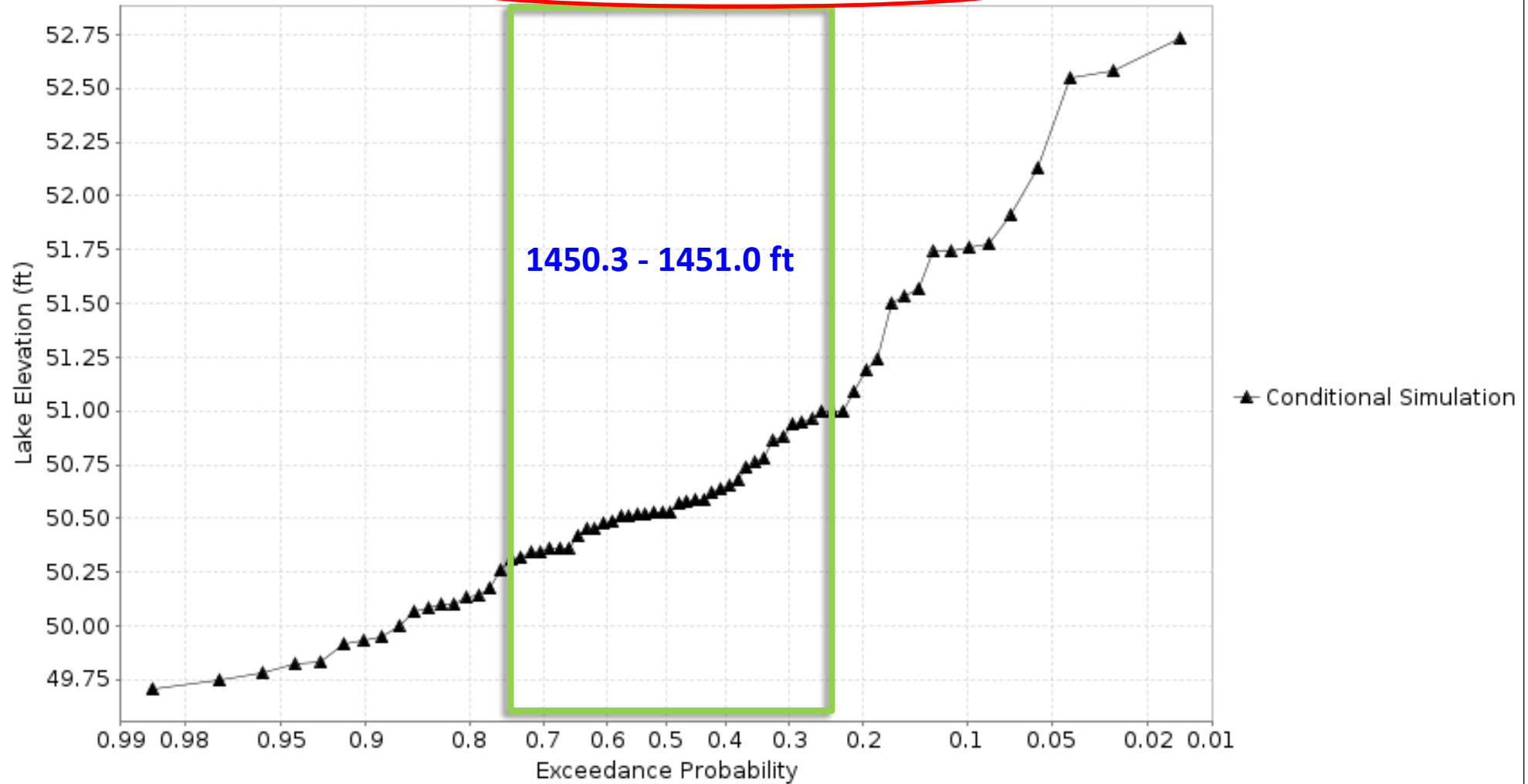
(Not taking into account precipitation type or melt rate.)

Probability of Rising to High Lake Levels on the Devils Lake at Devils Lake 5SW-Creel Bay (DCBN8)

Forecast for the period 02/21/2022 - 09/30/2022

This is a conditional simulation based on the conditions as of 02/21/2022

Pumping schedule : 350cfs Jun 1 - Nov 10



Current lake level: 1447.2 ft

*NGVD29 datum

DEVILS LAKE & STUMP LAKE... Long-Range Probabilistic Outlook
Valid February 7, 2022 - September 30, 2022

LOCATION	95%	90%	75%	50%	25%	10%	05%
CREEL BAY	1449.8	1450.0	1450.3	1450.6	1451.1	1451.9	1452.4
EAST STUMP LAKE	1449.8	1450.0	1450.3	1450.6	1451.1	1451.9	1452.4

The current heights of Devils Lake and Stump Lake are ~1447.28 ft. MSL.

Color code: Below Minor Moderate Major Flood of Record

RED RIVER AND TRIBUTARIES... Long-Range Probabilistic Outlook
Valid February 14, 2022 - May

LOCATION	95%	90%	75%	50%	25%	10%
WAHPETON	11.6	11.7	12.0	13.0	14.3	15.9
HICKSON	24.8	25.6	27.2	29.4	32.4	34.6
FARGO	24.0	25.2	27.2	30.9	33.9	35.9
HALSTAD	23.6	24.7	28.7	32.9	36.6	38.7
GRAND FORKS	36.8	38.7	41.8	44.4	46.1	49.2
OSLO	34.0	34.4	35.3	36.3	37.1	38.4
DRAYTON	36.8	38.0	39.8	41.1	42.2	42.9
PEMBINA	45.4	45.9	48.0	50.3	52.0	52.7

February 24, 2022 Outlook

February 10, 2022 Outlook

DEVILS LAKE & STUMP LAKE... Long-Range Probabilistic Outlook
Valid February 21, 2022 - September 30, 2022

LOCATION	95%	90%	75%	50%	25%	10%	05%
CREEL BAY	1449.8	1449.9	1450.3	1450.5	1451.0	1451.8	1452.3
EAST STUMP LAKE	1449.8	1449.9	1450.3	1450.5	1451.0	1451.8	1452.3

The current heights of Devils Lake and Stump Lake are ~1447.28 ft. MSL.

Color code: Below Minor Moderate Major Flood of Record

RED RIVER AND TRIBUTARIES... Long-Range Probabilistic Outlook
Valid February 14, 2022 - May 15, 2022

LOCATION	95%	90%	75%	50%	25%	10%	05%
WAHPETON	12.2	12.3	12.9	14.0	15.3	16.4	16.9
HICKSON	28.0	28.3	30.3	33.0	34.0	35.7	36.3
FARGO	27.9	30.3	31.9	33.7	35.4	37.9	38.5
HALSTAD	29.2	30.5	32.8	36.0	38.2	39.1	39.6
GRAND FORKS	41.9	42.5	43.8	45.8	47.7	50.3	52.0
OSLO	35.8	35.6	36.2	37.0	37.8	38.8	39.5
DRAYTON	40.1	40.3	40.7	41.7	42.8	43.4	44.3
PEMBINA	47.8	48.7	49.8	51.1	52.2	53.1	53.7

February 10, 2022 Outlook

Minnesota Tributaries:

South Fork Buffalo River.....							
SABIN	13.4	13.9	14.5	15.0	15.7	16.5	17.6
Buffalo River.....							
HAWLEY	6.0	6.5	7.3	8.0	9.3	10.1	10.5
DILWORTH	15.4	16.4	18.5	20.1	21.6	22.8	23.8
Wild Rice River.....							
TWIN VALLEY	5.7	6.0	6.6	7.6	9.2	10.2	11.2
HENDRUM	19.9	21.9	24.4	28.1	30.3	31.6	32.0
Marsh River.....							
SHELLY	9.1	9.6	10.7	12.3	15.6	17.2	18.6
Sand Hill River.....							
CLIMAX	14.8	15.8	18.5	22.8	26.1	30.1	31.2
Red Lake River.....							
HIGH LANDING	6.8	7.1	8.3	9.4	10.9	11.8	12.1
CROOKSTON	15.5	16.6	18.3	20.4	22.5	2	
Snake River.....							
ABOVE WARREN	63.7	63.9	64.2	65.1	65.9	6	
ALVARADO	101.3	101.9	103.0	105.3	107.4	10	
Two Rivers River.....							
HALLOCK	804.1	804.6	805.8	807.5	808.6	80	
Roseau River.....							
ROSEAU	11.7	12.1	13.3	14.6	15.6	1	

Minnesota Tributaries:

South Fork Buffalo River.....							
SABIN	13.5	13.9	14.6	15.1	16.0	16.9	17.7
Buffalo River.....							
HAWLEY	6.3	6.8	7.5	8.2	9.3	10.4	10.5
DILWORTH	16.4	16.6	18.9	20.5	22.2	23.1	23.9
Wild Rice River.....							
TWIN VALLEY	5.6	6.0	6.7	8.0	9.2	10.2	11.2
HENDRUM	25.4	25.9	27.3	29.7	31.3	31.9	32.4
Marsh River.....							
SHELLY	10.6	10.9	12.2	13.8	16.7	18.0	19.7
Sand Hill River.....							
CLIMAX	18.5	20.0	22.6	24.7	28.8	31.1	33.0
Red Lake River.....							
HIGH LANDING	6.6	6.9	7.8	9.0	10.6	11.6	11.8
CROOKSTON	14.3	15.6	17.1	19.4	22.1	24.3	26.1
Snake River.....							
ABOVE WARREN	63.6	63.7	64.0	64.9	65.7	67.4	68.7
ALVARADO	100.8	101.3	102.3	104.9	107.2	108.8	109.8
Two Rivers River.....							
HALLOCK	802.9	803.7	804.6	806.8	808.2	809.1	810.3
Roseau River.....							
ROSEAU	10.9	11.6	12.4	13.5	15.5	16.9	17.7

February 24, 2022 Outlook

North Dakota Tributaries:

February 10, 2022 Outlook

Wild Rice River.....							
ABERCROMBIE	10.1	11.9	14.1	16.9	19.8	23.2	24.6
Sheyenne River.....							
VALLEY CITY	12.2	12.6	13.4	15.8	19.2	22.1	23.0
LISBON	12.6	13.1	14.6	16.0	19.4	22.5	24.1
KINDRED	15.9	16.8	18.5	20.3	21.2	21.2	21.2
WEST FARGO DVRSN	15.7	17.2	18.0	21.1	21.3	21.3	21.3
HARWOOD	83.7	83.8	87.9	90.7	91.5	92.1	92.2
Maple River.....							
ENDERLIN	11.3	11.6	12.2	12.7	13.7	14.5	15.2
MAPLETON	19.2	19.5	20.5	21.7	22.4	23.3	23.9
Goose River.....							
HILLSBORO	10.4	11.4	13.1	13.8	14.9	15.8	16.4
Forest River.....							
MINTO	5.1	5.4	5.8	6.8	7.2	7.8	7.9
Park River.....							
GRAFTON*	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Pembina River.....							
WALHALLA	5.3	5.5	6.6	8.0	10.1	13.0	13.8
NECHE	9.7	10.3	11.8	15.3	18.6	21.3	21.4

North Dakota Tributaries:

.....	15.1	15.5	17.6	19.4	21.4	24.1	25.0
...	12.6	13.1	14.1	16.4	19.1	22.3	23.9
	13.9	14.2	15.1	16.6	19.8	23.1	25.2
	17.7	18.2	19.8	20.4	21.2	21.2	21.2
	17.2	17.7	19.3	21.3	21.3	21.3	21.3
	87.4	88.5	89.8	91.2	91.8	92.1	92.2
Maple River.....							
ENDERLIN	12.0	12.3	12.8	13.3	14.0	14.8	15.4
MAPLETON	20.3	20.6	21.5	22.1	22.8	23.3	23.9
Goose River.....							
HILLSBORO	11.7	12.4	13.7	14.4	14.9	15.7	16.6
Forest River.....							
MINTO	5.8	5.9	6.5	7.0	7.6	7.9	8.2
Park River.....							
GRAFTON*	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Pembina River.....							
WALHALLA	6.0	6.3	7.1	8.4	10.1	12.4	13.9
NECHE	10.7	11.6	13.5	16.0	19.2	21.1	21.4

February 24, 2022 Outlook

PFOS: Probabilistic Flood Outlook Summary

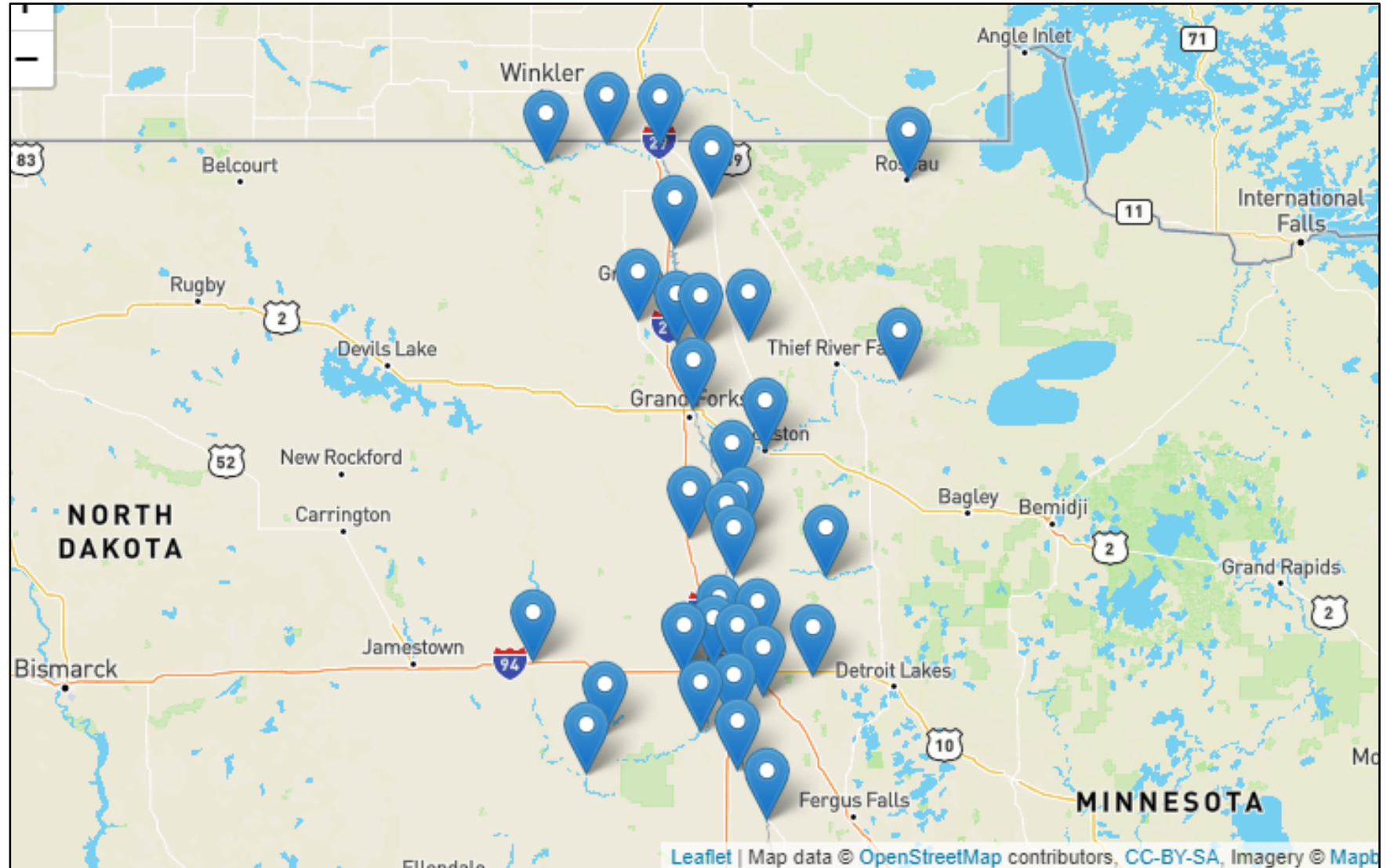
- Same probabilistic data, just in a different format
- Includes all Red River mainstem and tributary forecast points

At a glance, relates current risk to:

- flood categories
- recent crests
- floods of record

Remains an experimental product so feedback is critical to keep it going!

Use the map below to view forecast point PFOS Graphics
(click a site marker below, then click on the image to expand)



www.weather.gov/fgf/PFOS

PFOS: Probabilistic Flood Outlook Summary

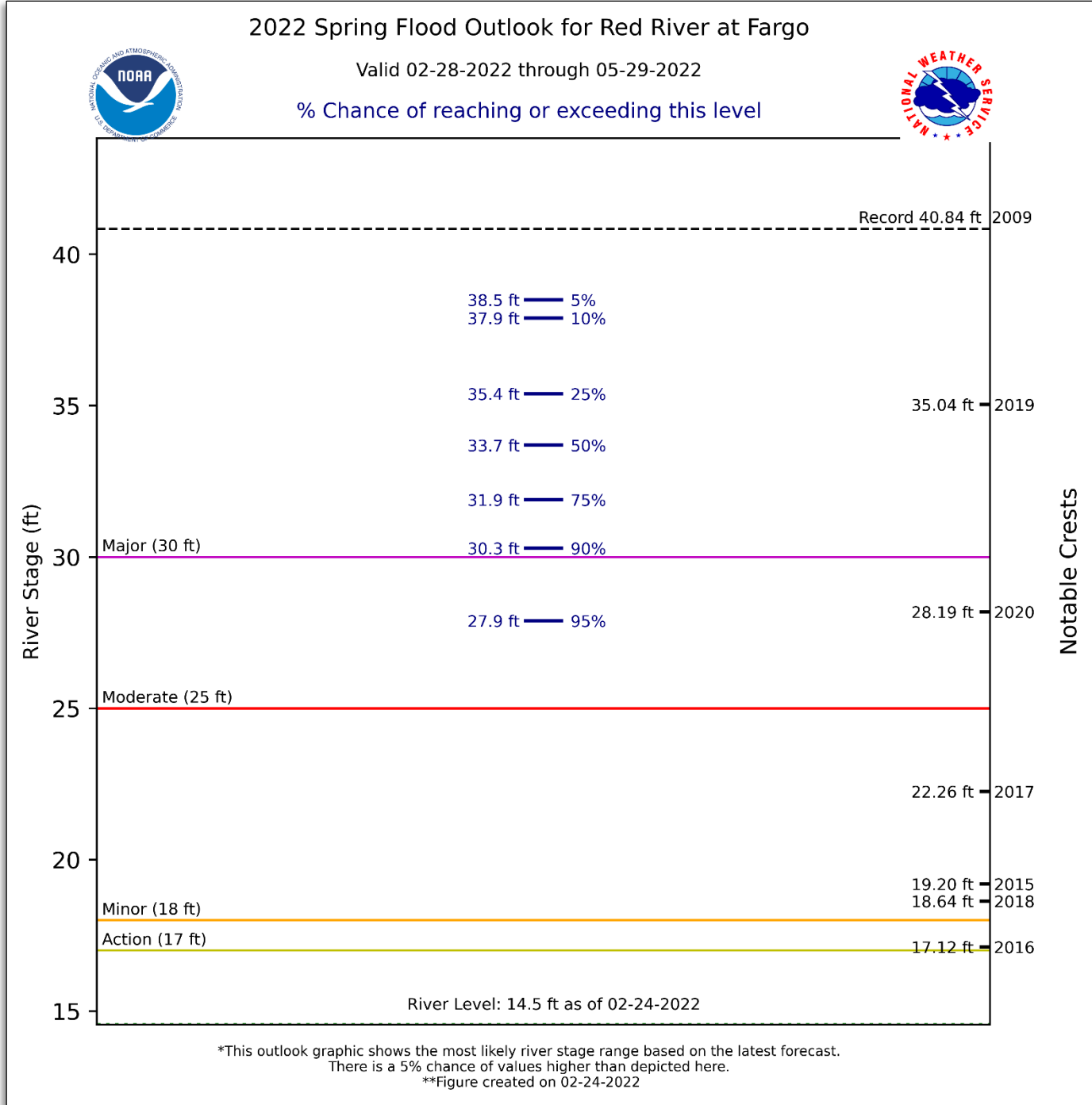
Please provide feedback:

amanda.lee@noaa.gov

or

Survey link from website

www.weather.gov/fgf/PFOS

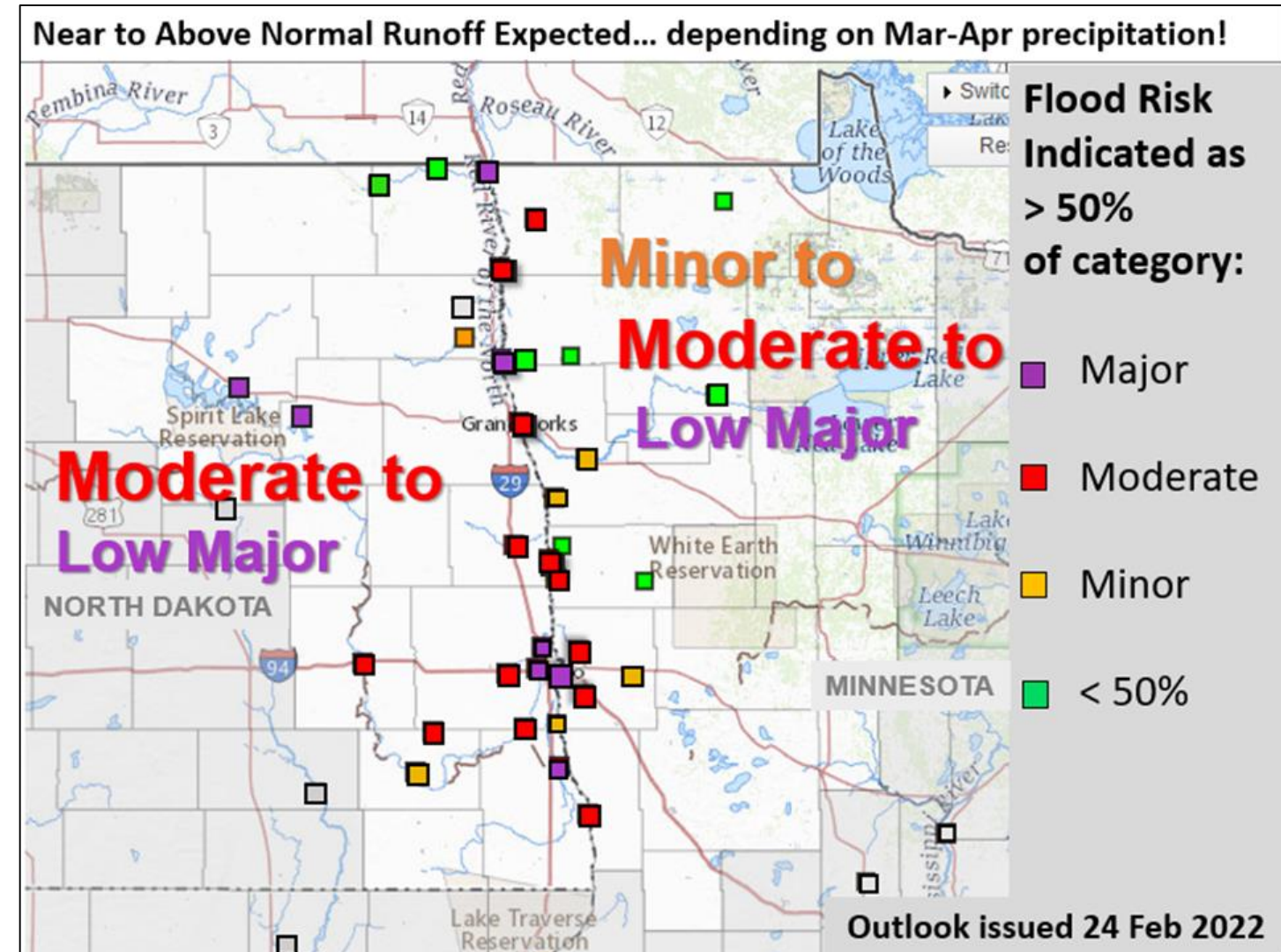


Bottom Line up Front:

- Risk for **significant flooding** is overall higher than historic* (raised once again since February 27th outlook).
- Generally **moderate to low end major flooding** is the main threat with some pockets of **minor flooding**.
 - Near normal soil moisture and base streamflow
 - Near normal to above normal snowpack/snow water content
- A brief warm up in the near term looks to trend back towards colder than normal temperatures with minor precipitation chances.
- March/April/May climate predictions suggest equal chances for below/normal/above temperatures and precipitation (i.e., no strong signal in any direction).

*Refers to Conditional Risk (this year) versus Historical Risk

Flood Risk by Category at River Forecast Points



Future 2022 Probabilistic Outlooks:

- **Thursday, March 10th**

Same day for all text, graphics, and webinars

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